INSTRUCTION MANUAL

for

RADIO INTERFERENCE-FIELD INTENSITY MEASURING EQUIPMENT NM-62B

STODDART
ELECTRO SYSTEMS
DIVISION OF TAMAR ELECTRONICS, INC.
2045 West Rosecrans Ave.
Gardena, California 90247

INSTRUCTION MANUAL

for the

STODDART NM-62B

RFI MEASURING EQUIPMENT

(1.0 to 10 Gc)

SERIAL NUMBER ______________

STODDART NUMBER 40315

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STODDART ELECTRO SYSTEMS
(Division of Tamar Electronics, Inc.)
2045 WEST ROSECRANS AVENUE
GARDENA, CALIFORNIA 90247

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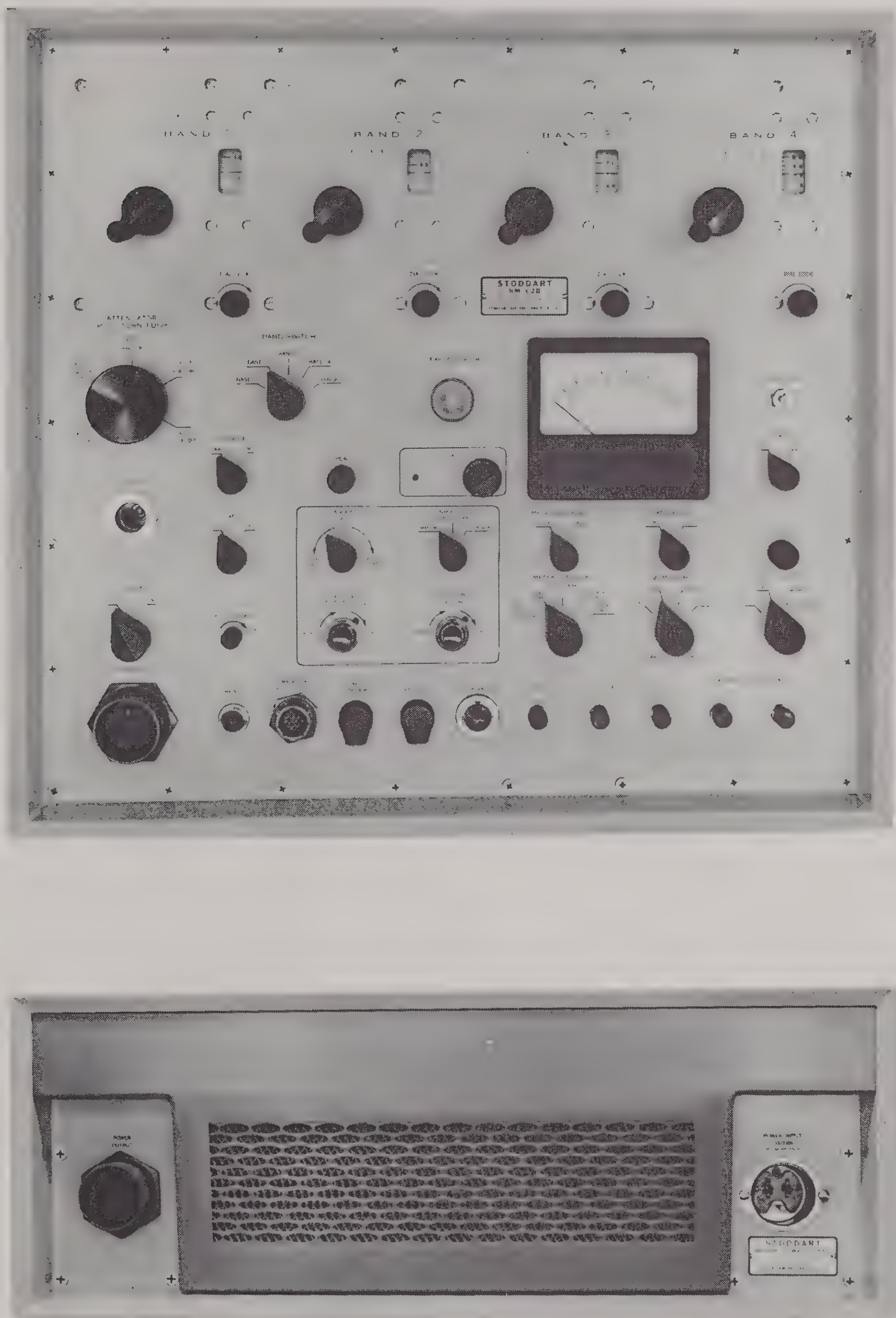

STODDART MODEL NM-62B RFI MEASURING EQUIPMENT

FREQUENCY RANGE - 1.0 TO 10 GC

SECTION I

OPERATING INSTRUCTIONS

1.1 GENERAL INFORMATION AND SPECIFICATIONS

The Stoddart NM-62B is a Radio Interference-Field Intensity Meter for measurements in the 1 to 10 gigacycle portion of the spectrum. The instrument is designed for use as a ground, mobile, ship or airborne station.

The unit consists of four RF tuners, the metering unit and the power supply. The specifications and a list of auxiliary equipment is shown below.

Specifications:

1. Frequency Range. - 1.0 gc to 10 gc in 4 bands; 1.0 - 2.3 gc; 2.3 - 4.4 gc; 4.4 - 7.3 gc; 7.3 - 10 gc.

2. RF Input Impedance. - 50 ohm, coaxial, VSWR less than 1.6 to 1 over the entire frequency range.

3. Sensitivity (MDS). - At input to cable adapter 93548-1 with bandwidth of 5 Mc, -87 to -95 dbm. With bandwidth of 0.5 Mc, -97 to -105 dbm. (For sensitivity with signal to noise ratio of unity, add 9 db to MDS values.)

4. Voltage Measurement Range. - 40 db on the meter scale plus 80 db of attenuation in 20 db steps permits a voltage measurement range from 10 μv or noise level to 10 volts.

5. Measurement Accuracy. - Overall measurement accuracy is ± 2 db.

6. Frequency Accuracy. - Indicated frequency is accurate within ± 1%.

7. Bandwidth. - Two bandwidths are provided, selectable by a front panel control. They are 5 ±0.5 Mc and 0.5 ±0.2 Mcs at the 6 db points.

8. Spurious Rejection. - Image rejection is greater than 60 db except from 6.3 to 7.3 gc and 8.5 to 10 gc where it is above 50 db. All other spurious responses are greater than 75 db down.

9. Shielding Effectiveness. - Greater than 90 db.

10. Local Oscillator Radiation. - Less than 200 picowatts from 1.0 to 7.3 GC and 500 picowatts or less above 7.3 GC.

11. Overload Capacity. - 20 db past full scale meter indication.

12. Detector Functions. - Field Intensity, Quasi-Peak, Slide-back Peak, Direct Peak.

13. Outputs. -

Video:	300 ohm output impedance 2.0 Mc bandwidth into a high impedance load up to 5 volts
60 Mc IF:	50 ohm output impedance 5 millivolts, 0.5 or 5 Mc bandwidth
160 Mc IF:	150 ohm output impedance 10 Mc bandwidth 500 microvolt
FM Output:	50 ohm output impedance 10 millivolts
Analog X-Y:	X output - 200 to 10,000 ohms output impedance. 1.0 to 10 volts ±0.5 volts in Full Range or single band. Load impedance should be greater than one megohm. Y output - 300 ohms output impedance. -3 to -1 volt approximately. Load impedance should be greater than 100,000 ohms
Remote Meter and Recorder:	1.5 volts DC at full scale meter deflection, across 1500 ohms resistive load
Phones:	600 ohms output impedance 100 milliwatts
Remote Data Display:	Multipin connector providing indications of attenuator position, band position frequency analog, calibrate, X and Y analog outputs.

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TABLE No. 1 (Continued)

FIGURE	PANEL LEGEND	FUNCTION
9.	PEAK	Slideback PEAK control. Adjusts the slideback peak detector voltage to extinguish the visual null indicator.
10.	CAL Button	Energizes impulse generator and switches unit into a calibration mode.
11.	CAL Control	Adjusts gain of the 160 Mc IF section when calibrating the instrument.
12.	SPEAKER ON/OFF	Switches the speaker ON or OFF.
13.	RF INPUT	Coaxial input from the antenna or other signal source in use.
14.	AFC ON/OFF	Switches the Automatic Frequency Control ON or OFF.
15.	SCAN RATE	Controls speed and direction of the driving motor.
16.	TUNING MODE	There are three tuning modes: Manual, Single Scan and Sector Scan. In the Manual position, the frequency of the tuner in use is controlled by its manual control (1). The Single Scan position allows the frequency of the desired tuner to be controlled by the Scan Rate (15) control. The Scan Rate controls the speed and direction of the motorized tuner scan when in Single Scan position. The scanning motor stops when the end of the band is reached. In Sector Scan position, the Scan Rate provides speed control of the tuner motor and the Sector Center Frequency and Sector Width control the frequency ranges that the tuner repeatedly scans over.
17.	METER RESPONSE	Changes the time constant of the meter to FAST or SLOW.
18.	BANDWIDTH	Selects bandwidths of either 0.5 or 5 Mc.
19.	AUDIO	Audio output control. Adjusts the audio level to the speaker and headphones.

TABLE No. 1 (Continued)

FIGURE	PANEL LEGEND	FUNCTION
18	BANDWIDTH	Selects bandwidths of either 0.5 or 5 Mc.
19	AUDIO	Audio output control. Adjusts the audio level to the speaker and headphones.
20	POWER ON/OFF	Turns power OFF and ON.
21	PANEL LIGHTS DIM	Allows the panel lights to be dimmed for night operation.
22	SECTOR CENTER FREQUENCY	Sets the center frequency of the sector being scanned, ±3% of true signal frequency.
23	SECTOR WIDTH	In SECTOR SCAN tuning mode, adjusts the frequency sector scanned by the tuner.
24	METER FUNCTION	Selects either the DIRECT PEAK, SLIDE BACK PEAK, QUASI-PEAK, or FIELD INTENSITY detector functions depending on the measurement required, and select the METER ZERO function.
25	QUASI-PEAK	Allows selection of four different sets of quasi-peak charge-discharge time constants.
26	VIDEO STRETCH	Stretches narrow pulses to make them suitable for oscillograph recording.
27	POWER IN	Connector for power cable from Power Supply unit.
28	READY	Glows green when the equipment is ready for operation.
29	REMOTE DATA DISPLAY	Multipin connector that contains indicator of mode of operation of instrument.
30	REMOTE METER	Supplies an output for a remote meter when this is required.
31	PHONES	Headphone output receptacle.

TABLE No. 1 (Continued)

FIGURE	PANEL LEGEND	FUNCTION
32	X-Y ANALOG	Provides an output for an X-Y recorder.
33	60 Mc IF	Provides an output to a second conversion receiver, such as the NM-30A RFI Meter.
34	160 Mc IF	Provides a 20 Mc bandwidth 160 Mc IF for application to a panoramic display device.
35	FM	Provides a demodulated output from an FM carrier for analysis.
36	DC VIDEO	Receptacle for connecting external equipment such as an oscilloscope.
37	STRETCHED VIDEO	Receptacle for connecting external equipment such as an oscillograph.
38	230V/115V	Selects either 230 or 115 volt, 50 or 60 or 400 cps, power input.
39	F1501 through F1507	Power Supply fuses.
40	POWER OUTPUT	Receptacle for power cable to Main unit.
41	POWER INPUT	Receptacle for the AC power cable.

1.2 MEASUREMENTS

1.2.1 Interference Measurements in Accordance with Military Specifications. - There are several military specifications which are of interest:

MIL-I-6181
MIL-STD 449
MIL-I-16910 (SHIPS)
MIL-I-26600 (USAF)
MIL-I-11748 (Sig C)
MIL STD 826

These specifications vary in the methods of interference measurement, terms of measurements, and in allowable limits of interference, but the NM-62B is suitable for performing the various measurements. The RFI calculator provided, gives a rapid method of translating the meter readings into the appropriate measurement terms.

1.2.2 Interference Measurements. -

Standard Detector Functions. - Four detector functions are provided. These are as follows: Slideback Peak, Quasi-Peak, Field Intensity and Direct Peak. The Field Intensity and Quasi-Peak detector functions are used for either conducted or field strength measurements of cw interference (In measuring to some military specifications a quasi-peak charge/discharge time constant of 1 millisec/600 millisec will be used). Slideback peak is used for conducted or field strength measurements of impulse, random noise, and pulse modulated cw interference. Direct peak is intended for cw or pulse modulated cw signals having a prf greater than 30 cps.

When making measurements to military interference specifications all signals are divided into either narrowband or broadband signals.

1.2.2.1 Narrowband Measurements. - The usual definition of a Narrowband signal is any signal having a spectral power distribution narrow compared to the nominal 6 db bandwidth of the IF amplifier. Continuous wave signals are a good example of this. Other signals, such as FM, which are not always Narrowband, have been classified as Narrowband for measuring purposes. All signals classified as Narrowband should be measured in either Field Intensity, Direct Peak, or Quasi-Peak detector functions, depending on the applicable specification. The following is a listing of signals classified as Narrowband:

1. Continuous wave (cw).
2. AM or SSB modulation.
3. Frequency Modulation.

1.2.2.2 Broadband Measurements. - Broadband signals are defined as those having a spectral power distribution that is broad compared to the nominal impulse bandwidth of the NM-62B. Broadband interference can be considered as being composed of sharp pulses, the pulse frequency determining the character of the interference. If the pulses are clearly separated, the interference is termed impulsive. Such interference can be generated by internal combustion engines or motor brush sparking.

If the pulses are not clearly distinguishable and overlap, then the interference is defined as random. A good example of this is thermal noise.

Other signals, not always broadband, have been assigned this classification for measurement purposes. These are the pulse modulated cw signals, mainly used by radar. Radar is the predominant type of signal within the measurement range of the NM-62B.

Most of these pulse modulated signals are within the limits specified in paragraph 1.2.2 for measurement by the Direct Peak function. All broadband signals can be measured by the Slideback Peak function.

Following is a list of signals classified as Broadband:

1. Pulse modulated cw
2. All pulsed radars
3. Random noise
4. Impulsive noise from motor brushes
5. Impulsive noise from engine ignition circuits
6. Corona discharge

The last two sources do not usually contribute significantly to interference problems above 1 gc.

1.2.2.3 Quasi-Peak Measurements. - Quasi-Peak measurements can be made of either narrowband or broadband signals. Quasi-Peak readings of broadband signals are weighted, falling somewhere between true peak and true rms value. On narrowband signals quasi-peak and field intensity readings agree when little or no modulation or interruption is present.

1.2.2.4 Direct Peak Measurements. - Direct peak measurements may be made of cw or pulse modulated cw signals having a prf greater than 30 cps. This includes most radar signals.

1.2.3 Laboratory and Field Site Interference Measurement. - For laboratory and production control measurements, screen rooms are used to obtain freedom from extraneous signals and maximum repeatibility in measurement of interference from a test sample. In military interference measurement specifications, the placement of the test sample and the antenna are carefully stipulated.

Interference surveys and open site measurements of radiated interference are performed using either the omni-directional discone or the directional horn antennas. For military interference open site testing, the antenna-to-test sample distance is controlled. Interference surveys to locate sources of man made interference are initially performed with the broadband omni-directional antenna, changine to the appropriate horn after discovering the general direction of the source.

1.2.4 Antenna Pattern and Field Strength Measurement. - Radiation measurements of field strength and antenna patterns are made using the horn antennas. To perform field strength measurements or surveys properly, the measurement engineer must consider site location, SHF propagation, antenna placement and orientation, RFI meter operation, ground conditions and other factors.

Using the RFI Calculator, field strength measurements may be expressed in terms of any of the following:

µv/meter	dbm/meter^2
db above 1 µv/meter	dbm/meter^2/megacycle
µv/meter/megacycle	watts/cm^2
db above 1 µv/meter/megacycle	

1.2.5 Laboratory Uses. - The NM-62B is a highly sensitive selective RF voltmeter. Some of the uses are listed below:

a) To measure the gain of an RF amplifier by measuring the signal input and output levels.

b) To check the voltage in any coaxial transmission system up to 10 volts. The NM-62B RFI Meter would take the place of the load where the line impedance is 50 ohms.

c) To determine the loss in a coaxial line connected to a signal generator by comparing the signal level at the input and output ends of the line.

d) Detector for RF bridge measurements.

e) To measure the impedance of squibs and igniters and associated circuitry.

f) For making attenuation measurements.

g) To measure leakage from RF switches.

h) Filter measurements.

i) To measure shielding effectiveness.

j) As a detector in slotted line measurements.

1.3 OPERATING INSTRUCTIONS

1.3.1 General Information. - Field strength measurements are made in terms of microvolts per meter or in watts per square meter.

Refer to Appendix A "Radiation Hazards" before making a measurement.

Before operating the equipment ensure that the 230V/115V switch (38), located beneath the fuse access panel, is set to the correct position for the power source in use.

1.3.2 Preliminary Steps. -

STEP 1. Set the POWER switch (20) to ON. The equipment becomes operative when the READY light (28) becomes illuminated. Connect the appropriate antenna or other signal source to the RF cable, 92477-1. Check the meter zero by setting the METER FUNCTION switch (24) to METER ZERO. If the meter (6) does not read zero, adjust the METER ZERO screwdriver adjustment (7) for a proper zero indication.

STEP 2. Set the BANDWIDTH switch (18) to the 5 Mc position.

STEP 3. Set the METER FUNCTION switch (24) to the QUASI-PEAK position.

STEP 4. Set the BAND SWITCH (4) to the desired frequency band. Set ATTENUATOR (3) to the X10 position.

STEP 5. Set AFC switch (14) to OFF position.

STEP 6. Set RECEIVE switch (8) to AM position.

STEP 7. Set METER RESPONSE switch (17) to FAST position.

STEP 8. Set QUASI-PEAK switch (25) to 0.05.600 position.

STEP 9. Search for a signal using the TUNING MODE switch (16) set to either MANUAL, SINGLE SCAN, or SECTOR SCAN. In SINGLE SCAN or SECTOR SCAN the tuning rate is controlled by the SCAN RATE control (15). In the SINGLE SCAN position the direction of drive and the rate are controlled by the SCAN RATE control. In the MANUAL position the tuners may be tuned manually (1).

STEP 10. After the desired signal has been found, orient the antenna for maximum meter indication by rotating the antenna in both planes and also by rotating the antenna about its longitudinal axis to receive the proper polarization. Set the ATTENUATOR control (3) to bring the meter needle to the upper portion of the scale.

1.3.3 Gain Calibration. - Before commencing measurements the gain of the equipment must be calibrated. This must be done after each change in frequency. Proceed as follows:

Press CAL button (10) and adjust CAL control (11) for a meter reading corresponding to the level indicated by the RFI calculator. Where greater accuracy is required use the figure at a particular frequency from Figure 1-2.

The instrument is now calibrated at the signal frequency and a measurement can be made. The loss of the RF cable, 92477-1 should not be considered when making a measurement since it is included in the calibration figures given on the RFI Calculator and in Figure 1-2. Figure 1-3 is a chart showing attenuation of RG9/U coaxial cable and is furnished for the convenience of the operator if additional lengths of RG9/U cable are attached to the standard RF Cable, 92477-1.

1.3.4 Making Measurements. - Peak the signal with the tuning control (1) and set the METER FUNCTION switch (24) to any desired position as follows:

FIELD INTENSITY - Gives an RMS reading of mcw or cw.

QUASI-PEAK - Gives a value related to the peak value dependent on the PRF and PW. Four QUASI-PEAK time constants are provided. The 1.600 position is the ASA time constant and is used in most military interference specifications where QUASI-PEAK is required. The 1.160 position is the CISPR time constant and is widely used in Europe and in the power industry in the United States. The 0.05.600 position is used to give a more sensitive QUASI-PEAK reading with low duty cycle signals. The 0.51.1 position is used to speed up the AGC loop when it is desired to examine the envelope of a pulsed signal of varying amplitude.

DIRECT PEAK - Gives peak values for cw and pulse modulated cw signals having a repetition rate greater than 30 cps.

SLIDEBACK PEAK - Gives a peak value for any type of signal.

1.3.4.1 NARROWBAND MEASUREMENT: Set the tuning control (1) for maximum indication on the meter (6). Set the ATTENUATOR (3) to obtain an on-scale meter reading.

CONDUCTED MEASUREMENTS: Multiply the meter reading in microvolts by the attenuator setting for a measurement in terms of microvolts across 50 ohms, or add the attenuator setting to the db meter indication to obtain the signal level in terms of db above one microvolt across 50 ohms.

FIELD STRENGTH MEASUREMENTS: Transfer meter indication to the top window of the calculator. Follow calculator instructions to determine MEASURED SIGNAL LEVEL.

1.3.4.2 BROADBAND SIGNAL MEASUREMENT:

1.3.4.2.1 Slideback Peak. -

a) Set the METER FUNCTION switch (24) to SLIDEBACK PEAK position.

b) Adjust the PEAK control (9) for a 100 microvolt (40 db) indication on the meter (6).

c) Set the ATTENUATOR (3) to X10. If the PEAK INDICATOR (5) is glowing, advance the ATTENUATOR until the lamp is extinguished.

d) Adjust the PEAK control (9) until the lamp just ceases to blink.

e) Transfer meter indication to top window of the calculator. Follow calculator instructions to determine the MEASURED SIGNAL LEVEL.

1.3.4.2.2 Direct Peak. -

a) Set the METER FUNCTION switch (24) to DIRECT PEAK position.

b) Set ATTENUATOR (3) to bring meter to upper half of scale.

c) Transfer meter indication to top window of the calculator. Follow calculator instructions to determine MEASURED SIGNAL LEVEL.

1.3.4.2.3 Quasi-Peak Measurements. - With the METER FUNCTION switch (24) in the QUASI-PEAK position either narrowband or broadband measurements can be made. In both cases use Narrowband Signal Measurement Instructions.

The meter can be read in terms of microvolts or db above 1 microvolt.

1.3.5 Signal Determination. - Determine if the noise is random or impulsive with headphones and/or an oscilloscope. In the case of random noise for example, grass will be observed on the oscilloscope. In the case of impulsive interference the pulses will be seen on the oscilloscope. Some ingenuity may be required in many cases to establish the exact nature of the signal.

Should the meter needle appear to "jitter" because of random amplitude variation of the signal, set the METER RESPONSE switch (17) to SLOW.

The 60 Mc IF output (33) is provided for use with the NM-30A equipment or a receiver that can tune to this frequency, thus narrowing the bandwidth and greatly increasing the cw sensitivity.

To determine if the signal is wideband or narrowband in nature, set the BANDWIDTH switch (18) to 0.5 Mc. If the signal is random noise and has a wide spectral distribution, the meter reading will decrease by approximately 10 db. If the signal is random but not "white" noise, the signal decrease will be somewhat less than 10 db when the BANDWIDTH is changed from 5 to 0.5 Mc. If the signal is impulsive in nature the signal indication will decrease more than 10 db when the BANDWIDTH is changed from 5 to 0.5 Mc. A wideband oscilloscope is helpful in determining the exact nature of the interference.

The 0.5 Mc bandwidth should not be used when making accurate measurements of broadband signals. When using the 0.5 Mc bandwidth for narrowband signal measurements, care must be taken to see that the signal is accurately tuned at all times. The tuning should be checked after changing attenuator steps since the high voltage is momentarily removed from the klystrons during this operation.

A type of signal of special interest is a pulsed cw signal such as a radar transmitter produces. Although classified as a broadband signal in military interference specifications, a pulsed cw signal has some characteristics that resemble narrowband signals. For example, a cw pulse may be thought of as having a distinct carrier frequency much as an AM signal has. The spectral power distribution of a single rectangular cw pulse in principle extends to infinity and to zero from the carrier frequency, the relative amplitude of the components being given by $\frac{\sin \pi fT}{\pi fT}$. Since the detector of the usual receiver ignores phase information the actual spectrum information available will show the absolute amplitudes of the various spectral components.

A typical cw pulse then will have a wide spectral distribution with the first zeros at $\frac{1}{T_1}$ (where T = pulse width) on each side of a carrier and with zeros recurring at $\frac{1}{T}$ intervals as far on each side of the carrier as the power is detectable. Actual pulses are never rectangular and the spectral distribution is somewhat different than the ideal case, the exact spectral envelope being determined by the nature of the pulse shape,

Where a narrowband signal is being recorded for an extended period of time set the AFC switch (14) to ON.

If the pulse width is narrow compared to the frequency response of the recorder a video stretch facility is provided. The VIDEO STRETCH switch (26) has four positions, giving four degrees of stretch, 0, 30, 160, and 800 microseconds. No stretching occurs in the 0 position. The 30, 160, and 800 microsecond positions are for use with 5000, 1000, and 200 cps recorder galvanometers, respectively. The recorder should be connected to the STRETCHED VIDEO receptacle (37) and the VIDEO STRETCH switch operated to a position where proper operation of the recorder is obtained. If the output is being observed on an oscilloscope, at the DC VIDEO receptacle (36), the VIDEO STRETCH switch should be left in the 0 position.

1.4 SIGNAL INPUT DEVICES

Five antennas are provided, four horns for directional measurements and an omni-directional discone antenna for broadband search. The discone is equipped with a removable shield which may be installed when some directivity is required.

Band 1 and 2 horns are complete units and fit to the tripod by means of the special mount provided. Band 3 and 4 horns are used in conjunction with the antenna reflector. A unique design incorporated in the Horn Antenna Mounting Base and the Antenna Reflector provides a rapid and continuously rotatable adjustment of the horns about the axis of the main lobe, without disturbing the azimuth and elevation settings.

1.5 USING THE RFI CALCULATOR

The top window in the RFI Calculator represents the NM-62B meter scales. Set the meter reading to the arrows on the top window. The interference measurements may then be read off in the required terms from the appropriate scale. Apply the attenuator setting to the corrected value, adding in the case of db and multiplying in the case of microvolts.

For power measurements in terms of watts (NB1 and NB3) square the attenuator multiplier. For example:

Meter Scale Readings: 20 microvolts

Attenuator Setting: X10^3

NB1 reading will be 8 $\mu\mu$watts

Square attenuator setting: $(10^3)^2 = 10^6$

Now apply this squared value to the NB1 reading:

i.e.: 8$\mu\mu$watts X 10^6 = 8 x 10^6 $\mu\mu$watts.

1.5.1 Derivation of the Various Scales. - The construction of the RFI Calculator was made possible because of the following constant parameters; input impedance, bandwidth, and antenna factors of the horn antennas.

NB1 - Micro-microwatts. Since the NM-62B has a nearly constant input impedance of 50 ohms the voltage reading on the mater scale may be converted to a power reading by the following expression:

$$\text{Power} = \frac{E^2}{Z}$$

NB2 - Dbm means power ratio in db referred to 1 milliwatt. Since the NM-62B has a constant input impedance of 50 ohms, its voltage reading may be converted directly into power.

As $\text{db} = 10 \text{ Log}_{10} \frac{P_1}{P_2}$ the power derived from the voltage reading may be expressed in dbm.

NB3 - Watts per square centimeter X 10^{-16}. In free space the strengths of the electric and magnetic fields (E and H) have a definite relation to each other at any given point and time. Their ratio E/H is equal to $\sqrt{\mu/\epsilon}$ and is called the impedance of free space. It has the dimensions of a resistance. E is measured in volts per meter and H is measured in amperes per meter. μ and ϵ are the absolute permeability and permittivity respectively of free space, their values in the MKS system being $\mu = 4\pi \times 10^{-7}$ and $\epsilon = 10^7/4\pi C^2$ (where C is equal to the velocity of light) whence the impedance of free space is $4\pi C \times 10^{-7} = 377$ ohms.

For a plane wave the rate of energy flow across an area of one square meter is EH watts. This can also be expressed as E^2/Z where Z is the impedance of free space.

To measure the power density of an electro-magnetic signal with a particular antenna it is necessary to know the effective aperture of the antenna and the wavelength of the signal. These two quantities combine to yield an expression called the antenna factor. This antenna factor is the ratio between the field strength of the wave in free space and the voltages or power delivered to the antenna terminals. Since the NM-62B measures this power, and as these antenna factors are constant in a properly designed antenna, a scale relating the meter reading to power density may be plotted. The scale labelled NB3 is plotted in terms of watts per square centimeter because this is the terminology of radiation hazard specifications.

NB4 - DBM per square meter. This scale is related to NB3 in the same fashion as NB2 is related to NB1.

NB5 - Microvolts per meter. This scale is derived from the information set forth in the discussion of NB3.

NB6 - DB above 1 microvolt per meter. This scale is related to NB5 by the following expression:

$$db = 20 \, Log_{10} \frac{E_1}{E_2}$$

BB1 - Microvolts per megacycle. Since the NM-62B has an impulse bandwidth of 5 megacycles the impulse voltage per megacycle will always be one-fifth of the meter reading.

BB2 - DB above 1 microvolt per megacycle. This scale is related to BB1 by the following expression:

$$db = 20 \, Log_{10} \frac{E_1}{E_2}$$

BB3 - DBM per square meter per megacycle. This scale is a continuation of NB4, the index marks being 14 db apart because of the 5 megacycle impulse bandwidth of the NM-62B. (The ratio of 5 megacycles to the 1 megacycle unit is 14 db.)

BB4 - Microvolts per meter per megacycle. This scale is related to NB5 in the same fashion as BB3 is related to NB4.

BB5 - DB above 1 microvolt per meter per megacycle. BB5 is related to NB6 in the same manner as the two preceeding scales.

1.6 CONDUCTING A FIELD SURVEY

An interference survey of a suspected source should begin with a series of measurements at the frequencies under investigation using the appropriate antenna.

During the survey the received signals should be monitored aurally using sufficient volume level to identify the signal or interference. It will be found helpful to monitor the signal with an oscilloscope.

The whole spectrum covered by the RFI Meter may be observed in many cases using the discone antenna. After a signal source is located in the spectrum, a magnetic bearing of the signal source may be made using the appropriate horn antenna. The antenna must first be oriented with a magnetic compass so that 0 degrees on the azimuth scale points to magnetic north. The geographic location of the interfering source can then be determined by triangulation.

It should be noted that correct bearings can be obtained on a line-of-sight basis only.

1.7 USE OF THE X-Y ANALOG OUTPUT

The X-Y Analog output is used for spectrum signature studies. Spectrum analysis of microwave signal sources can be made using an X-Y recorder.

The X-Y output may also be fed into an oscilloscope for viewing or photographing a spectral plot.

The X output voltage is a function of frequency and varies from approximately +1.0 to +10 volts with an output impedance variation of 0 to 5000 ohms. It is linear with frequency. Since the output impedance is variable the external load should be kept above 500,000 ohms to preserve linearity. This is easily accomplished with most X-Y recorders and oscilloscopes available.

The Y output voltage varies from approximately 2.0 to - 0.3 volts with an output impedance of 300 ohms. The load resistance should be kept above 30,000 ohms.

When switching any controls on the front panel of the NM-62B such as the scanning controls, function switch, band switch, attenuator, etc., the recorder pen should be lifted since switching transients may be recorded along with actual signals.

The procedure for setting up a Moseley Model 135 X-Y Recorder to the NM-62B follows. After turning the NM-62B on, set up the controls according to the following instructions:

1. AFC (14) to OFF.
2. BANDWIDTH (18) to 5 Mc.
3. METER RESPONSE (17) to FAST.
4. METER FUNCTION (24) to FIELD INTENSITY, QUASI-PEAK, or DIRECT PEAK depending on the nature of the s signals. If the nature of the signals is unknown use the QUASI-PEAK function, and set QUASI-PEAK switch (25) to 0.05.600.
5. RECEIVE (8) to AM.
6. ATTENUATOR (3) to +20 db/X10.
7. BAND SWITCH (4) to tuner covering the desired frequency range.

It may be found necessary to advance the ATTENUATOR (3) to higher attenuation levels to record all the signals present. The NM-62B is calibrated for a range of 40 db so if a signal is seen to exceed this range, advance the ATTENUATOR until the signal is within the calibrated range.

The X-Y recorder may now be set up as follows:

STEP 1. Fill the pen reservoir with ink and install it in the carriage.

STEP 2. Set the power switch to ON.

STEP 3. Set the pen switch to standby.

STEP 4. Put the recording paper into position and move the power switch to the vacuum "ON" position.

STEP 5. Set the "X" "Function" switch to "volts", the "Fix-Var" switch to "Var", and the "Range" switch to "1".

STEP 6. Set the "Y" "Function" switch to "volts", the "Fix-Var" switch to "var", and the "Range" switch to "0.5".

STEP 7. Connect the X-Y recorder cable to the NM-62B X-Y ANALOG output (32) and connect the X and Y plugs at the end of the cable into their respective receptacles on the X-Y recorder. Ground the X minus receptacle to the recorder chassis ground receptacle.

STEP 8. On the NM-62B front panel, set the METER FUNCTION switch (24) to SLIDEBACK PEAK, turn the CAL control (11) to the extreme counterclockwise position and turn the PEAK control (9) to move the meter needle to zero. Turn the manual tuning knob (1) of the tuner in use to bring the tuner to the low frequency end of the band.

STEP 9. Move the "pen" switch to the "Up" position and use the "Zero" control to zero the pen in the X axis. Use the "Var" control to zero the pen in the Y axis.

STEP 10. Turn the PEAK control (9) on the NM-62B to move the meter to full scale. Adjust the "Zero" control to move the pen to full scale in the Y axis. If the paper provided by STODDART is used, full scale will be the 40 db/100 microvolt mark. Using the manual tuning knob (1), bring the tuner in use to the high frequency end of the band. Adjust the "Var" control to move the pen to full scale in the X axis. If the paper provided by STODDART is used, full scale will be the highest frequency mark.

STEP 11. Set the "Pen" switch to "Standby".

STEP 12. Calibrate the NM-62B according to the instructions in Paragraph 1-3.

STEP 13. Set the NM-62B TUNING MODE switch (16) to either SINGLE SCAN or SECTOR SCAN as desired.

STEP 14. Set the "Pen" switch to "ON".

STEP 15. With the SCAN RATE control (15) on the NM-62B adjust the scanning rate of the tuner in use to the desired rate.

For absolute power level of a signal at a particular frequency, refer to Figure 1-4 for the variation in gain with frequency of the NM-62B. If greater frequency resolution is desired the NM-62B bandwidth may be changed to 0.5 Mc with the BANDWIDTH switch (18).

1.8 OPERATION OF MILLIAMMETER RECORDER

Operation of the 91987-( ) Milliammeter Recorder is explained in a separate instruction manual. Refer to the recorder instruction manual for the correct procedure to start inking system, adjust zero, and set chart speed. After the recorder and the RFI Meter are prepared for operation, the chart scale must be calibrated against the RFI Meter scale.

RECORDER CALIBRATION - Proceed as follows:

STEP 1. Plug the 90075-1 Recorder Cable connector into the REMOTE METER receptacle (30) on the NM-62B.

STEP 2. Turn CAL control (11) fully counterclockwise.

STEP 3. Set ATTENUATOR (3) to X10 or higher position.

STEP 4. Set METER FUNCTION switch (24) to PEAK position.

STEP 5. Adjust PEAK control (9) for a 1 microvolt meter indication.

STEP 6. Start recorder and run until a short (1/4 inch) length of chart paper has been inked. Stop the recorder.

STEP 7. Adjust PEAK control successively to 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 microvolts, each time starting and stopping the recorder.

STEP 8. Transfer these chart paper marks to a straightedge. This straightedge can be used thereafter as a direct reading scale for chart conversion of recordings.

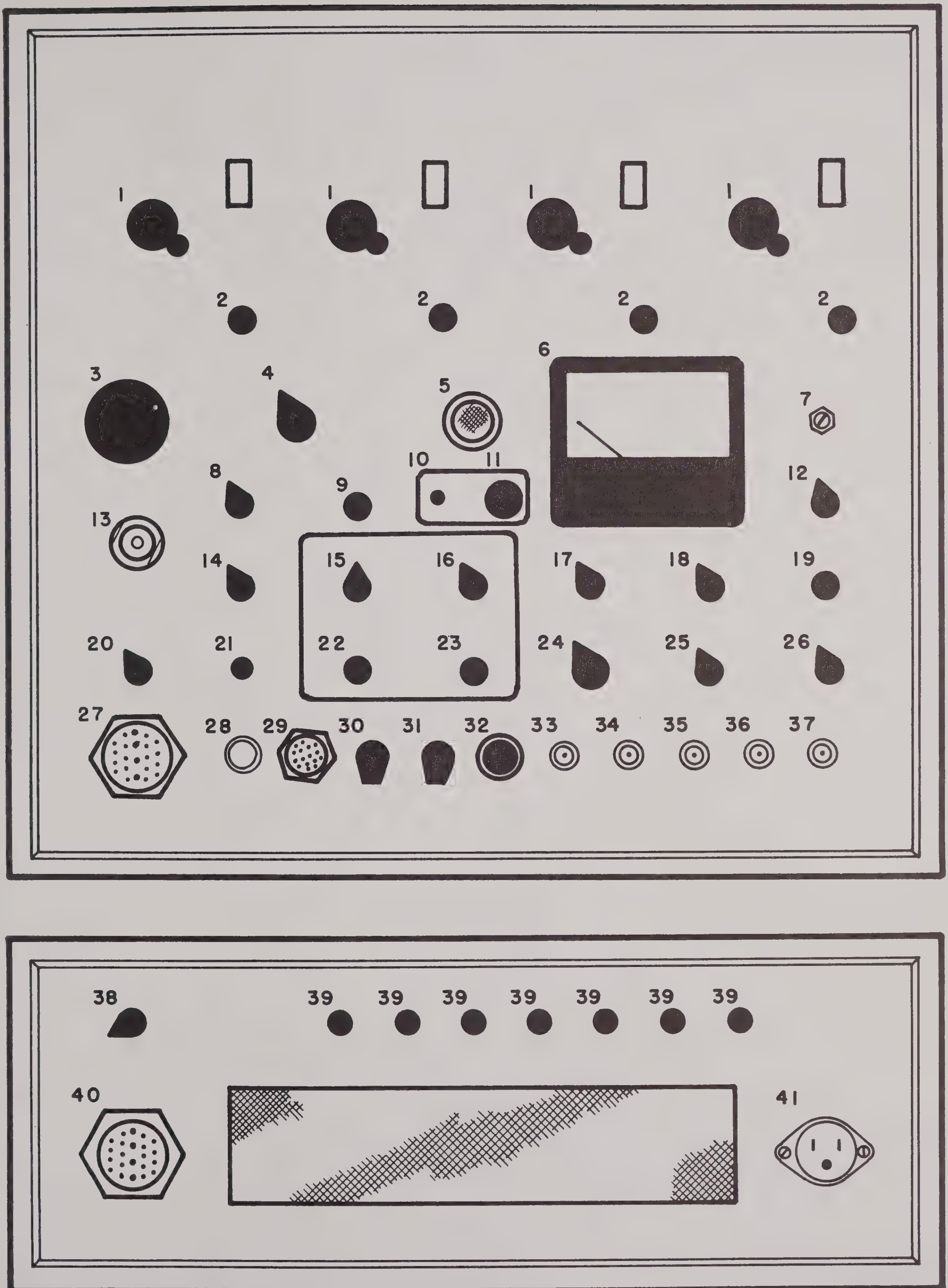

FIGURE 1-1. FRONT PANEL, NM-62B

STEP 13. Set the NM-62B TUNING MODE switch (16) to either SINGLE SCAN or SECTOR SCAN as desired.

STEP 14. Set the "Pen" switch to "ON".

STEP 15. With the SCAN RATE control (15) on the NM-62B adjust the scanning rate of the tuner in use to the desired rate.

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STEP 8. Transfer these chart paper marks to a straightedge. This straightedge can be used thereafter as a direct reading scale for chart conversion of recordings.

PANEL LEGEND

1- BAND 1 THRU 4 TUNING
2- DIAL LOCK
3- ATTENUATOR
4- BAND SWITCH
5- PEAK INDICATOR
6- METER
7- METER ZERO
8- RECEIVE AM - FM
9- PEAK
10- CALIBRATE PUSH BUTTON
11- CALIBRATE
12- SPEAKER ON-OFF
13- RF INPUT
14- AFC ON-OFF
15- SCAN RATE
16- TUNING MODE
17- METER RESPONSE
18- BANDWIDTH
19- AUDIO
20- POWER OFF-ON
21- PANEL LIGHTS
22- SECTOR CENTER FREQ
23- SECTOR WIDTH
24- METER FUNCTION
25- QUASI PEAK
26- VIDEO STRETCH
27- POWER IN
28- READY LIGHT
29- REMOTE DATA DISPLAY
30- REMOTE METER OUT
31- PHONES OUT
32- X-Y ANALOG OUT
33- 60MC IF OUT
34- 160MC IF OUT
35- FM OUT
36- VIDEO DC OUT
37- VIDEO STRETCHED OUT
38- 230V - 115V SWITCH
39- FUSE
40- POWER OUT

41- POWER INPUT

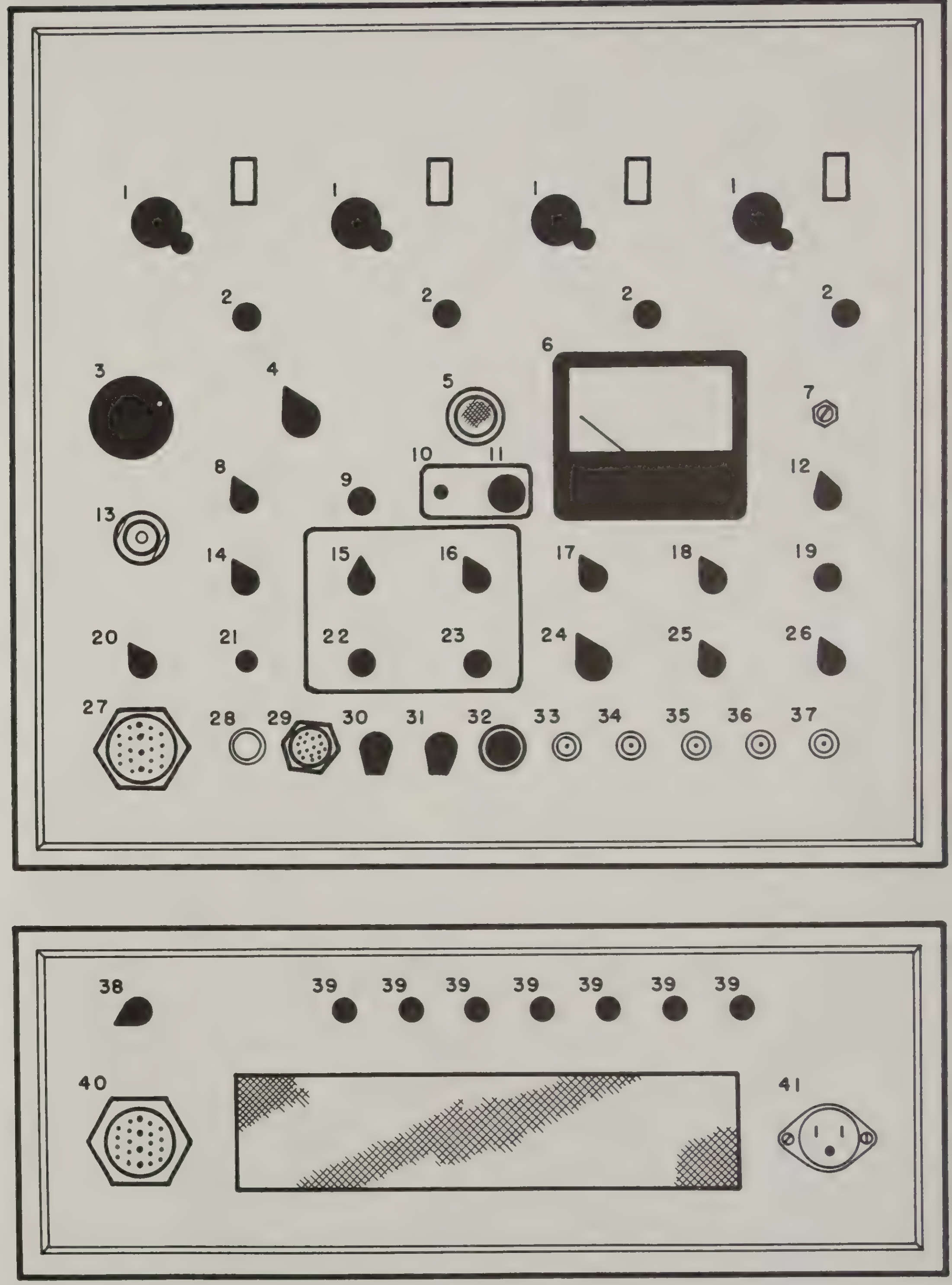


FIGURE 1-1. FRONT PANEL, NM-62B

CALIBRATING ENGINEER: ______________

DATE: ______________

NM-62B SERIAL NO. SAMPLE

STODDART AIRCRAFT RADIO CO., INC.

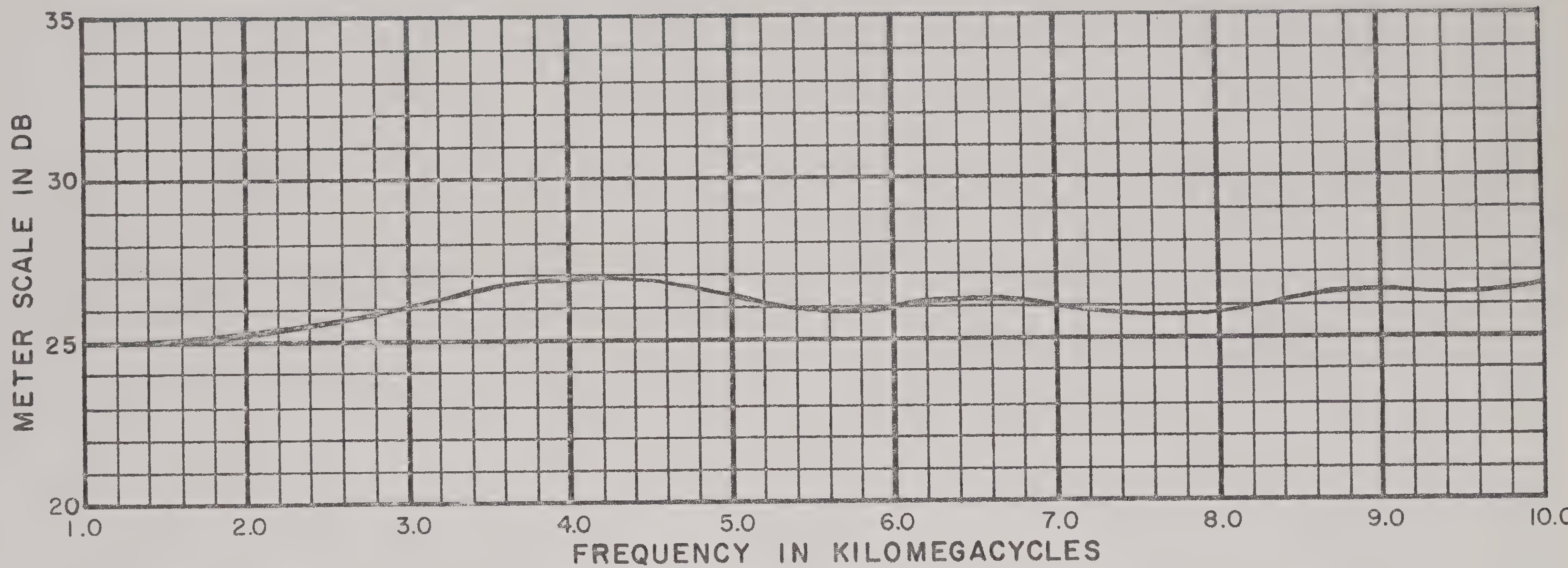


FIGURE 1-2, CALIBRATION CHART

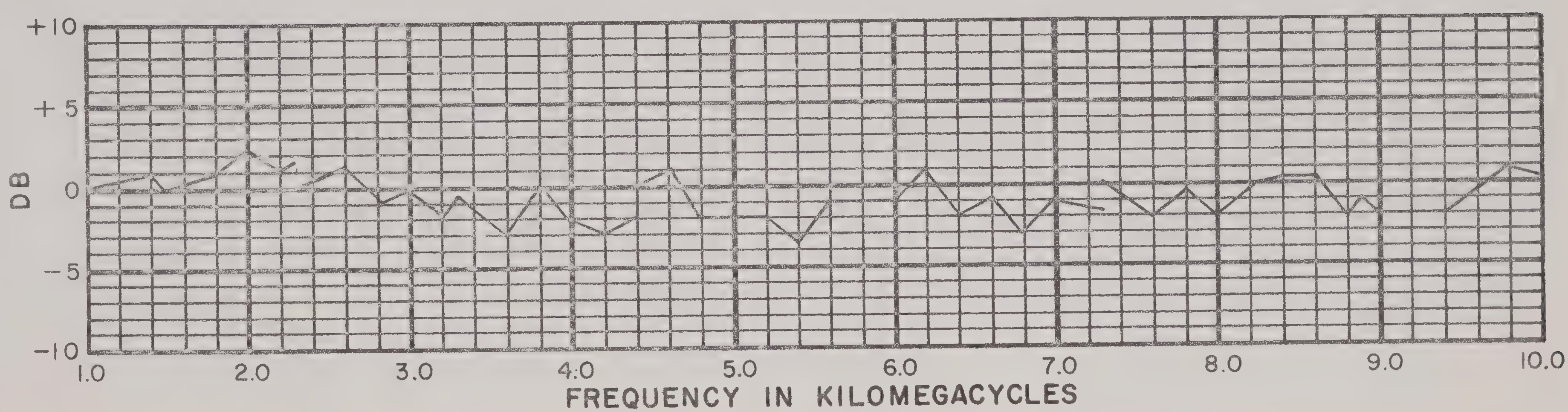


FIGURE 1-4, GAIN VARIATION VS FREQUENCY

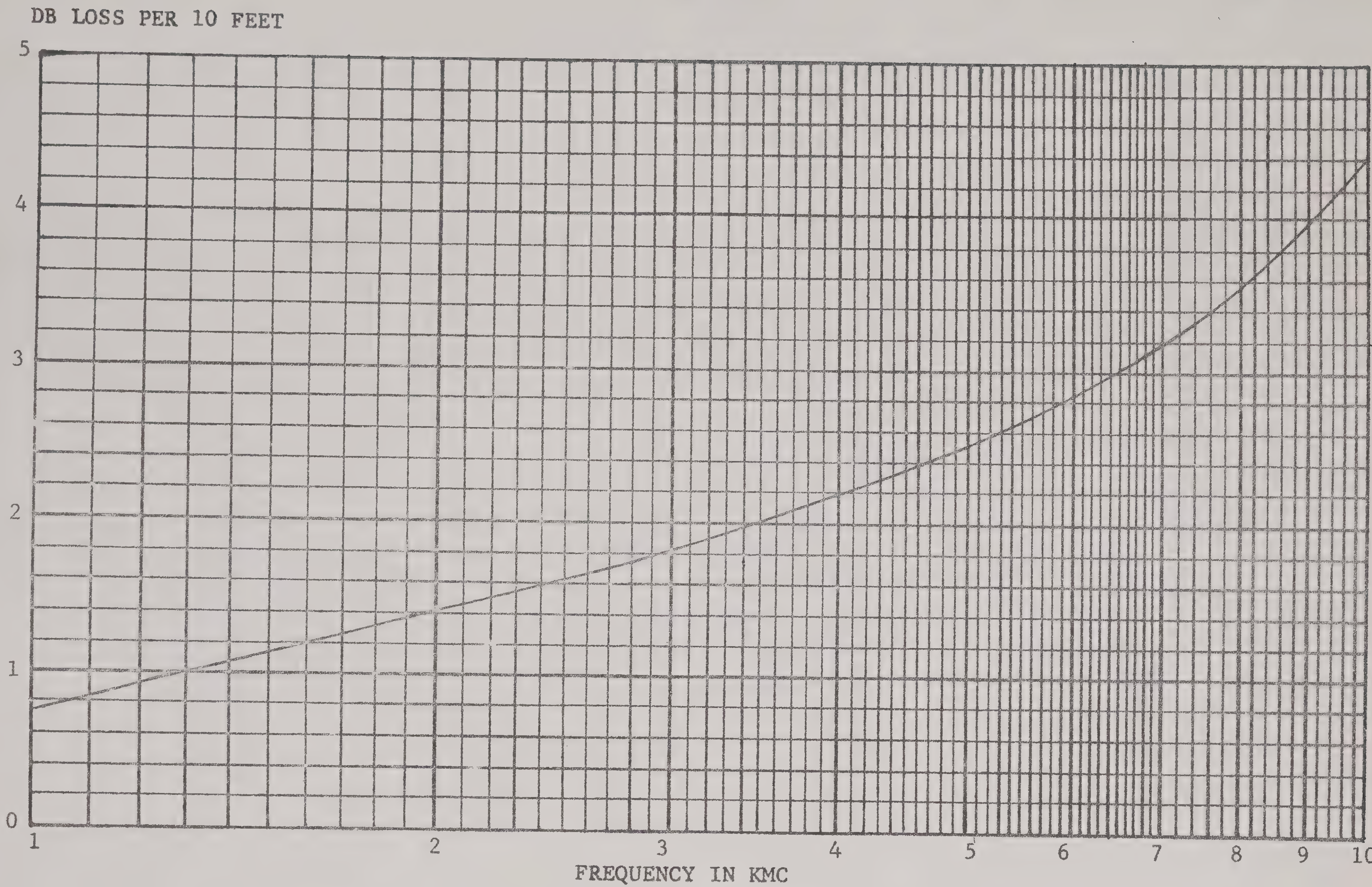


FIGURE 1-3, ATTENUATION OF RG 9/U COAXIAL CABLE

SECTION II

TECHNICAL DESCRIPTION

2.1 INTRODUCTION

This section contains a technical description of the Stoddart Model NM-62B RFI Meter. The NM-62B is functionally divided into separate chassis as shown on the Block Diagram, Figure 2-1, and referred to the Interconnecting Wiring Diagram, Figure 2-2.

2.2 RF INPUT CIRCUITS

The input signal from an antenna, or other signal source is normally applied via a 6-foot coaxial cable to the RF INPUT receptacle, J1571, then to the step ATTENUATOR, AT1501 through AT1505. The attenuator provides up to 60 db of attenuation for the signal, in 20 db steps. From the attenuator, the signal is applied to the RF Transfer, S1524, which is controlled by the BAND SWITCH. The RF Transfer applies either the input signal, or the calibration signal from the Impulse Generator to one of two ferrite isolators. The ferrite isolators are used to decrease the input VSWR, and to minimize the local oscillator radiation.

When the BAND SWITCH, S1506, is set to either BAND 1 or BAND 2, the signal is applied through the Low Band Isolator, Z1504, and selector, S1523, to the appropriate RF Tuner. Similarly, when S1506 is in either the BAND 3 or BAND 4 position, the signal is applied through the High Band Isolator, Z1505, and selector, S1522, to the appropriate RF Tuner.

2.3 RF TUNERS

The 1 to 10 Gc range of the NM-62B is covered by four RF Tuners. While there is some difference, both physically and electrically, between the tuners, the theory of operation of one will suffice for all. Any differences are discussed under separate headings.

2.3.1 <u>Band 1 Tuner (1.0 to 2.3 Gc).</u> - From S1523, the signal passes to the lowpass filter, FL101, and via a coaxial cable to the RF preselector Z101 (refer to Figure 2-3).

2.3.1.1 <u>Preselector Circuit.</u> - A preselector is used consisting of three overcoupled circuits which provide image rejection of greater than 60 db. The coupled circuits are coaxial cavities coupled by means of rectangular apertures. These cavities are tuned to the proper electrical length by axial movement of the center conductors.

As can be seen from the schematic diagram, the preselector is ganged mechanically to the local oscillator, the reference voltage potentiometer, the X-Analog potentiometer, and the digital potentiometer. To eliminate problems associated with sliding metal contacts, such as tuning noise, erratic contacts, friction and wear, a non-contacting short circuit to the center conductor is provided at the end of each cavity. The non-conducting shorting elements use a compound line to provide a low impedance to the center conductor at the end of each cavity. The compound line consists of a section of coaxial line which has a very low impedance, followed by a series connected short-circuited section of coaxial line having a very high impedance. The compound line presents a low input reactance over a wide frequency range when each coaxial section is approximately one-quarter wavelength long at the mid-frequency, and the ratio of the impedance of the two sections is made as large as possible. The spacing between the inner and outer conductors in the low impedance section is about 0.006 inches, giving a characteristic impedance of approximately 2 ohms. The characteristic impedance of the short-circuited section is approximately 30 ohms. Tuning noise is eliminated by the isolation provided by the compound line between the cavities and the plunger supporting bearings.

2.3.1.2 Local Oscillator. - The local oscillator, V103, uses a reflex klystron tube (6BM6) with a coaxial cavity resonator external to the tube. The oscillator tunes over its frequency range 160 Mc above the RF signal frequency. The correct reflector to cathode voltage is obtained by varying potentiometer R105A, which with X-Analog potentiometer R105B, and digital potentiometer R105C, is mechanically ganged to the oscillator cavity and the preselector. Oscillator injection for the mixer is supplied by a probe inserted in the oscillator cavity. The local oscillator cavity operates in the TEM mode.

There are several possible values of reflector voltage suitable to sustain oscillations at a given frequency; however, for an oscillator to tune continuously over a wide frequency range, it is necessary to track the reflector voltage to the tuning, so that it remains at all times within the reflector mode limits. Where the length of a cavity resonator is a three-quarter wavelength at the operating frequency and the 3-3/4 reflector mode is used (as in the case of the Band 4 tuner) it would be possible in a simple cylindrical cavity for the tube to oscillate, at certain tuning positions and reflector voltages, at a frequency corresponding to the one-quarter wavelength cavity modes with 1-3/4 cycle reflector transit time. In other instances (as in the Band 3 tuner) the unwanted oscillations can occur at two frequencies. The unwanted oscillations are removed in the Band 3 tuner by means of wave guide traps loaded with lossy materials.

Reference voltage regulation is provided by V104 through V106, dropping the -650 volt input to the required cathode voltage of -360, and holding this voltage constant.

Three test points are provided. The cathode voltage may be measured at J105. The reflector voltage, before application of AFC, may be measured

at J106, and the -650 volts input may be measured at J107. The voltage from J105 to J107 is -350 volts and the voltage present between J105 and J106 is the reflector to cathode voltage.

2.3.1.3 Crystal Mixer. - The output of the preselector and the local oscillator beat together in the crystal mixer, CR103, to produce a 160 Mc signal applied to the preamplifier.

A decoupling network, built into the mixer, presents a high impedance at the point where power from the local oscillator is introduced. This in turn controls the amount of local oscillator power fed to the crystal and terminates the local oscillator to mixer coupling cable. The network consists of an "L" pad in which the shunt element is a polyiron core inserted in the crystal holder assembly and a 51-ohm resistor, R104, is included as the series section.

This resistor, R104, acts as a lossy dielectric in which the loss increases with the frequency because of the shunting capacitance along its length. Thus, the resistor is the main factor controlling the amount of local oscillator power fed to the crystal at the higher ends of the range, and the polyiron core is the main factor at the lower end. A 10db pad, AT101, is included in the local oscillator coupling cable to stabilize the local oscillator power level.

2.3.1.4 AFC Adder. - The AFC voltage is applied to the adding circuit, CR101 and CR102, via C119, causing a small addition or subtraction to the reflector voltage, depending on the polarity of the AFC voltage, thus correcting any frequency deviation which may occur.

2.3.1.5 160 Mc IF Preamplifier. - The preamplifier is a two-stage, grounded grid amplifier consisting of triodes, V101 and V102, synchronously tuned by transformers, T102 and T103, to provide a bandwidth of approximately 14 Mc, and a gain of 30db. The grounded grid configuration gives low noise and wide dynamic range characteristics. The output of the preamplifier is applied via the IF cable to a four position coaxial Band Selector, S1512.

2.3.2 Band 2 Tuner (2.3 to 4.4 Gc). - The schematic diagram of the Band 2 Tuner is shown in Figure 2-4. Differences between the Band 1 and Band 2 Tuners are as follows.

The local oscillator uses a 6BL6 reflex klystron (V203) and a coaxial cavity resonator external to the tube. The oscillator tunes over its frequency range 160 Mc below the RF signal frequency. The local oscillator power is fed directly to the mixer instead of through a 10db pad as in the Band 1 Tuner.

Because of the higher frequency of the Band 2 Tuner, the coaxial cavity resonators have plungers of different lengths than those of the Band 1 Tuner. As in the Band 1 Tuner, graphite slugs are inserted in the axial slots of the plungers to eliminate interfering parasitic resonances.

2.3.3 Band 3 Tuner (4.4 to 7.3 Gc). - Differences between the tuners previously discussed are covered in the following sub-paragraphs. The schematic diagram is shown in Figure 2-5.

2.3.3.1 Local Oscillator. - The local oscillator uses a 5721 reflex klystron and tunes over its frequency range 160 Mc above the RF signal frequency. An additional difference is the installation of two waveguide traps as an integral part of the cavity to suppress spurious oscillations.

The local oscillator operates throughout the frequency range on the 2-3/4 cycle reflector mode so that the reflector to cathode voltage variation is considerably greater than in the Band 1 and 2 Tuners, varying approximately -50 to -500 volts. The tube operates with a resonator grid potential of 1000 volts, and an average cathode current of 18 milliamperes.

2.3.3.2 Voltage Regulation. - Because of the higher voltage required by the 5721 reflex klystron it will be noted that an extra regulating stage has been added.

In addition, the zener diode CR304 has been included in the cathode circuit to increase the stability of the grid current.

2.3.4 Band 4 Tuner (7.3 to 10 Gc). - The differences in this tuner are discussed in the following sub-paragraphs. The schematic diagram is shown in Figure 2-6.

2.3.4.1 Local Oscillator. - The local oscillator uses a 2K48 reflex klystron and tunes over its frequency range 160 Mc below the RF signal frequency. The oscillator operates throughout the frequency range in the 3/4 wavelength cavity mode and the 3-3/4 cycle reflector transit mode so that the reflector to cathode voltage varies from -75 to -240 volts. The tube operates at a resonant grid potential of 1295 volts above the cathode with an average cathode current of 12 milliamperes.

It is possible for the cavity to resonate at a frequency corresponding to a one-quarter wavelength cavity mode, with a 1-3/4 reflector transit time. To prevent this undesirable condition a mode suppressor is included in the outer wall of the cavity. The annular slot between the mode suppressor head and the cavity, and the turned down section of the outside of the head of the main cavity body forms a short section of low impedance coaxial line, effectively in series with the cavity outer conductor. The length of this series section and its position along the outer conductor is chosen to present an appreciable reactance to the interfering mode at points where the modes coincide.

Because higher-order circumferentially propagated modes might be excited by the mode suppressor, a parasitic resonance could occur. Five slots placed in the outer conductor of the mode suppressor, loaded with lossy dielectric slugs, serve to suppress all such parasitic oscillations.

2.3.4.2 Crystal Mixer. - A decoupling network built into the 1N2510 mixer presents a high impedance at the point where power from the local oscillator is introduced. This controls the amount of local oscillator power fed into the crystal, and terminates the local oscillator-to-mixer coupling cable.

The network consists of a section of concentric line with a characteristic impedance considerably higher than the local oscillator-to-mixer cable. This section of line, located at the mixer end of the local oscillator feed is made one-quarter wavelength at the mid-band frequency. A lossy dielectric bushing together with a similar bushing located at the oscillator output terminates the high impedance line with a low impedance to the RF signal at the local oscillator signal input junction. The bushings also serve to attenuate the local oscillator power to the proper mixing level.

2.4 IF AMPLIFIERS

The 160 Mc output of the RF Tuners (Figures 2-1 and 2-2) is applied to the Band Selector circuit, S1512, where the desired tuner output is selected and applied to the IF Attenuator selector, S1511. This attenuator selector operates in conjunction with the step ATTENUATOR to add an additional 20 db of IF attenuation in the $X10^2$ through $X10^5$ positions. Thus, a total of 80 db of signal attenuation is available.

2.4.1 Attenuator Selector Operation. - Depending on which section of S1512 is closed (which Band is in use), the 160 Mc signal at J1511 is applied to S1511, at J1510. The IF attenuator selector is in turn controlled by the step attenuator switch, S1521. When the ATTENUATOR is set to the X10 position, S1511 is de-energized and the 160 Mc signal is applied to the IF Converter at J1508.

However, in the $X10^2$ through $X10^5$ positions of the ATTENUATOR, S1511, is energized and the 160 Mc signal is applied through AT1506, which adds 20 db of attenuation, before being applied to the IF Converter. The 160 Mc signal is also applied through a 6 db attenuator, AT1507, to the 160 Mc IF OUTPUT receptacle, J1517, where it is available for use with an external panoramic display receiver if desired.

2.4.2 First IF and Converter. - The First IF and Converter (Figure 2-7) consists of two 160 Mc IF amplifier stages, V501 and V502, an oscillator-tripler, V503, and a mixer, V504.

2.4.2.1 160 Mc Amplifier. - The 160 Mc IF signal from the 20 db IF Attenuator selector, S1511, is applied through a 160 Mc bandpass filter, Z1501, to the IF input at P502. The signal is applied to the first stage at the tap on L501, amplified by V501 and V502, and applied to the suppressor grid of the mixer, V504. The CAL control, R1533, located on the front panel controls the IF gain by varying the resistance in the cathode of V501 and V502.

2.4.2.2 160/60 Mc Converter. - The local oscillator, V503, functions in a Butler oscillator-tripler configuration, with the 73.3333 Mc crystal, Y501, connected between the two cathodes. The "A" section of V503 has its plate circuit resonated at 73.3333 Mc by L505. The plate circuit of the "B" section is resonated to the third harmonic, 220 Mc, by L517. The 220 Mc signal is then applied to the control grid of the mixer, V504, where it mixes with the 160 Mc signal to produce a 60 Mc output at P1564. The bias network, C507, R524, R525, and C532, is included to provide optimum control grid bias with respect to cathode for most efficient mixing. A 73 Mc series resonant circuit consisting of the combination C535 and L518 is also included at the input to the mixer to trap any stray 73 Mc signal from the mixer.

2.4.3 Main IF Amplifier. - The 60 Mc output of the IF Converter at P1564 is applied to the coaxial bandwidth switch, S1509, (Figure 2-8).

2.4.3.1 0.5 Mc Bandwidth. - When the BANDWIDTH switch, S1510, on the front panel is set to the 0.5 Mc position, S1509 is energized. This applies the 60 Mc IF signal to the input of V1011, which is a unity gain amplifier having a bandwidth of 0.5 Mc. The gain of this stage is controlled by the NARROW BW GAIN potentiometer, R1546. The output of V1011 then passes back through another set of contacts of S1509, and is applied to the input of V1001. This establishes an overall bandwidth of 0.5 Mc for the complete IF amplifier.

2.4.3.2 5 Mc Bandwidth. - When S1510 is in the 5 Mc position, the 60 Mc IF signal is applied directly to the input of V1001 through the de-energized S1509. The stages V1001 through V1003 are stagger tuned, with L1002 resonant at 63.5 Mc, and L1003 at 56 Mc.

The screen grid voltage for V1001 and V1002 is set by adjustment of the FI-100 potentiometer, R1547, which is one of the controls used to establish correct meter scale tracking. A thermistor, RT1001, located in the cathode of V1003, varies the gain of this stage directly with temperature. The amount this stage varies positively with temperature has been set equal to the negative varience of the rest of the IF, thus providing temperature compensation for the whole IF strip.

The output of V1003 is coupled to V1004 by a double tuned transformer, T1001. Bias to V1004 is dependent on the meter tracking potentiometers, SP-100, DP-100, or QP-100. Two further stages of amplification, V1005 and V1006, have identical coupling to that just described. It will be noted that in the case of the coupling from V1006 to the push-pull amplifier stages, V1007 and V1008, the primary is capacitively tuned. The purpose of this method of tuning is to simplify the tuning procedure required to achieve a properly balanced circuit. The zener diodes, CR1001 and CR1002, maintain the proper cathode bias on V1007 and V1008. The zener diode CR1003 establishes a maximum voltage on the screens of V1007 and V1008, so that the maximum screen dissipation is within the

rating of the tubes. The DYNAMIC RANGE potentiometer, R1544, permits adjustment of the screen voltage to maintain the metering overload capability of 20 db.

The output of the push-pull amplifier is fed to the detector, V1009, via transformer T1005. The 60 Mc AFC output is taken from the cathode of V1009, and is coupled through C1006 to receptacle P601 via a coaxial cable. The 60 Mc IF output is obtained from the plate of V1009 through C1031 and applied to the 60 Mc IF OUTPUT receptacle, J1527, located on the front panel. Further down-conversion and narrower bandwidth may be obtained if desired by using an external receiver, such as the Stoddart NM-30A, at this point.

The two cathode followers, V1010A and B, provide low-impedance outputs to the chopper and video circuits at J1002 and J1003, respectively.

2.4.4 Gain Standardization. - The NM-62B is calibrated in the direct-peak detector function. The calibration function is automatically sequenced by three relays, K1510 through K1512 (Figure 2-2), when the CAL button, S1518, is pressed. The gain is then standardized by adjustment of the CAL potentiometer, R1533, to set the IF gain. When S1518 is released the equipment returns to the mode of operation previously established.

All three relays have four sets of contacts, and have their coils connected in parallel. The relays are normally de-energized, however, when the CAL button is pressed the relays are energized from the -28 volt bus.

The automatic functions performed when the unit is calibrated are as follows:

a) The signal source is removed from the appropriate ferrite isolator by the RF Transfer, and the Impulse Generator output applied in its place.

b) The detector function is switched to the direct-peak mode.

c) The IF bandwidth is switched to the 5 Mc position.

d) The AFC is removed.

e) The 20 db IF attenuator is switched in.

f) +200 volts is applied to the Chopper Chassis.

g) The meter response is switched to the slow mode.

2.5 AFC CIRCUITS

The AFC signal is developed from the 60 Mc AFC output of the Main IF Amplifier. The signal is amplified and applied to a discriminator to develop a DC level, and also to provide the FM output. The DC level in turn is applied to a chopper circuit in the Metering Chassis where it is chopped. The chopped wave is then amplified and applied to the AFC adder circuits in the RF Tuners to correct frequency drift by a compensating change in the klystron reflector voltage.

2.5.1 AFC Chassis. - The 60 Mc AFC signal at J601 (Figure 2-9) is applied to a tap on L601, where it is amplified by V601 through V603. The first two stages, V601 and V602, are stagger tuned, with L602 resonant at 64 Mc, and L604 at 56 Mc.

The output from V603 is applied to a limiter, composed of diodes CR601 and CR602, and to the discriminator, which consists of the series tuned circuits L603 and C622, and L606 and C623, in conjunction with diodes CR603 and CR604. The two discriminator outputs are filtered to remove any 60 Mc component, and applied to J1522 and J1523.

2.5.2 Chopper Circuit. - The discriminator outputs are aapplied to two sets of contacts on relay K1102 (Figure 2-10). This relay is energized from the -28 volt bus when the RECEIVE switch, S1516, is in the AM position. In this position, the two discriminator outputs are applied across the DISCRIM ZERO potentiometer, R1549. The time constant established by C1103 and R1104, and C1104 and R1105, is sufficiently long to develop the AFC level from a pulsed signal.

In the FM position, the discriminator outputs are applied across the series resistances R1102 and R1103, with the output taken at the junction. The FM output at receptacle J1526 is obtained at this point. The FM time constant is determined by these two resistances and the distributed capacity of the input cables, affording a 2.5 Mc response for an FM signal. A CW signal provides AFC in either position of S1516.

The AFC signal is obtained from the arm of R1549 in the AM mode, and from the junction of R1102 and R1103 in the FM mode. This signal is applied to contact 10 of relay K1101. Relay K1101 is energized or de-energized according to which RF Tuner is in use. The relay switches the signal from the desired discriminator load, and the chopping voltage to one of two bi-polar choppers. The chopping voltage is coupled through transformer T1101 from the unbalanced, 1 kc multivibrator, V1101. The two chopper circuits have opposite output polarity since Bands 1 and 3 Tuners, which use the CHOPPER BAL 1 circuit, have their local oscillators above the input frequency, while Bands 2 and 4, which use the CHOPPER BAL 2 circuit, have local oscillators operating below the input frequency.

The outputs of the CHOPPERBAL 1 (made up of R1164, CR1105, CR1116, R1115, and R1117) and CHOPPER BAL 2 (consisting of R1163, R1118, R1119, CR1104, and CR1115) circuits are connected to the grid of V1102A. V1102 provides two stages of amplification, and its output provides pulses whose polarity and amplitude are proportional to the AFC voltage. These pulses are applied to the AFC adder located in the klystron reflector circuit of the appropriate tuner, which is a bi-polar pulse stretcher, the DC output of which adds or subtracts to the reflector voltage.

2.6 DETECTOR FUNCTIONS

The following sub-paragraphs discuss the time constant introduced into the detector and AGC circuits at various positions of the METER FUNCTION switch, S1513. These time constants determine the time versus voltage characteristics of the meter indication obtained.

The positions of S1513 are as follows:

a) FIELD INTENSITY

b) QUASI-PEAK

c) DIRECT PEAK

d) SLIDEBACK PEAK

e) METER ZERO

2.6.1 FIELD INTENSITY Function. - In the FIELD INTENSITY position the output of the detector, V1009, supplies both AGC and VTVM voltages. The AGC voltage is applied via S1513C to the first and second IF amplifiers, V1001 and V1002. The VTVM voltage is applied to the grid of the first half of the VTVM differential amplifier, V1105, which drives the meter. In this detector function the cathode of the detector is biased through the resistor network R1534 and R1536 (FI 1 potentiometer).

2.6.2 QUASI-PEAK Function. - In the QUASI-PEAK position the cathode follower, V1010, drives the pulse stretching networks connected to the QUASI-PEAK switch, S1514. Four separate time constants of charge time versus discharge time are provided, 0.05/1, 0.05/600, 1/160, and 1/600 milliseconds.

The 0.05/1 millisecond RC network consists of C1509 and R1524. The 0.05/600 millisecond RC network consists of C1509 and R1523. The 1/160 millisecond RC network consists of C1509, C1510, and R1522. The 1/600 millisecond RC network consists of C1509, C1511, and R1521. It will be noted that C1509 remains in the circuit; however, its value is so small in relation to the

capacitors used in the slow charge networks, C1510 and C1511, that its effect on the resultant time constants is negligible. The diode CR1505, because of its high back resistance and low forward resistance to the negative detected signals, gives a charging path that will not discharge the RC network.

2.6.3 DIRECT PEAK Function. - The DIRECT PEAK measurement circuit is included as a meter function to measure cw or pulse modulated signals having a repetition rate greater than 30 cps. Such a signal could not be measured in any detector function other than SLIDEBACK PEAK; but, in this latter case the measurement is a slow and tedious manual operation.

In the DIRECT PEAK function a cw signal is "chopped" to become a pulse signal at the input to the video amplifier. A pulse modulated signal is similarly chopped, however this does not affect the measurement as any pulse, of no matter what duration within the limits stated, is formed into a 10 microsecond pulse of the same amplitude as the received pulse.

The 10 microsecond pulse duration time was arbitrarily chosen for optimum performance. The formed pulse is amplified and delivered to a pulse stretching network by a cathode follower driver whose impedance is sufficiently low (20 ohms) to charge the capacitor in the pulse stretching network during the 10 microsecond duration of the pulse. This capacitor holds its charge for a long enough period (0.25 seconds) for the meter to indicate a single pulse. The capacitor must be partially discharged to enable the meter to follow succeeding pulses of varying amplitude. To accomplish this, the 10 microsecond pulse is delayed one microsecond during amplification. This delay is used to form a sharp spike from the leading edge of the pulse, which is amplified and fed back in opposite polarity to the charge capacitor, thus partially discharging the capacitor. The circuit is then prepared to receive and measure the next pulse.

2.6.3.1 Chopper Circuit. - When the METER FUNCTION switch, S1513, is placed in the DIRECT PEAK position (or the CAL button, S1518, is pressed) +200 volts is applied to energize relay K1301 (Figure 2-12). This relay initiates operation of the "chopper" circuits to chop the video before it is applied to the first video amplifier.

A 6.3 volt AC signal is applied to the grid of V1303B where it is amplified, and rectified by CR1304 to produce a positive going pulsating DC signal. This signal is then applied to the common grid input of V1302B and V1303A as a modulating signal. The combination V1302 and V1303A form an A-stable multivibrator, producing a square wave output at the plate of V1302A.

The multivibrator output is applied through C1301 to the base of Q1301, which functions as a switching transistor. Q1301 in turn damps the grid of V1301 to ground across CR1303 at Q1301's switching rate. The IF Video is applied to the grid of V1301 through R1302, which isolates the DC Video from the

chopped signal at pin 7 of V1301. The chopped signal is then applied to the first video amplifier from the cathode of pin 8, V1301.

2.6.3.2 Pulse Forming Network. - The 10 microsecond pulse is formed at the grid of V1203 in the following manner. The output of the first video amplifier, V1202, is slightly stretched by the pulse stretching network, CR1202, R1222, and C1213. At the end of 10 microseconds, C1213 is discharged by a pulse fed through CR1203, thus forming the 10 microsecond pulse required.

2.6.3.3 10 Microsecond Discharging Pulse Formation. - The signal from the first video amplifier drives the double triode pulse amplifier, V1205, whose output is fed to the amplifier, V1207, through the pulse stretching network CR1208, R1247, and C1228. The output of V1207 is applied to the delay line, DL1202, which forms a 10 microsecond pulse fed to the grid of the second half of V1201 through a differentiating network. The biasing of this tube is such that the trailing edge of this pulse only is amplified. The resultant positive going spike is applied to the grid of V1203 to form the 10 microsecond pulse previously discussed.

The formed 10 microsecond pulse, whose amplitude is proportional to the incoming signal, is amplified by V1203 and delayed one microsecond by the delay line DL1201. The output of the delay line drives the double cathode follower V1204, whose output charges the pulse stretching network giving the output voltage. This voltage is divided down to supply the AGC and VTVM voltages.

2.6.3.4 Fast Discharge Circuit. - The pulse required for the fast discharge circuit is provided by differentiating the leading edge of the output of V1207. This differentiated sharp pulse is amplified by the first half of V1208, and applied to the second half of V1208 which is a cathode follower having the necessary low impedance to discharge the pulse stretching capacitor C1220. The pulse is sufficiently narrow and of great enough amplitude to achieve nearly complete discharging action in one microsecond.

2.6.4 SLIDEBACK PEAK Function. - In the SLIDEBACK PEAK position the METER FUNCTION switch connects the AGC and VTVM circuits to the detector through resistor R1062 (Figure 2-8). At the same time the negative slideback bias voltage, determined by the PEAK control setting (R1529) is applied to the detector via R1039. Any signal of greater amplitude than the slideback voltage overrides it and is amplified by V1202, V1205, and V1207 (Figure 2-11), as in the DIRECT PEAK circuit. The output of V1207 triggers the slideback peak multivibrator, V1209, which has the PEAK INDICATOR, I105, in its plate circuit. Thus, any signal exceeding the slideback bias voltage causes the indicator to glow.

2.6.5 METER ZERO Function. - When the METER FUNCTION switch, S1513, is set to the METER ZERO position, the meter zero may be re-set by adjustment of the METER ZERO potentiometer, R1519 (Figure 2-2). The potentiometer is connected between the plates of the differential amplifiers, V1105 and V1107 (Figure 2-10).

2.6.6 Meter Tracking and Balancing Potentiometers. - The functions of the various meter tracking and balancing potentiometers are described in the following sub-paragraphs.

2.6.6.1 FI-1 and FI-100 Potentiometers. - The FI-1 potentiometer, R1536 (Figure 2-2), is connected to the detector circuit in the Main IF Amplifier when the METER FUNCTION switch, S1513, is set to the FIELD INTENSITY position. The function of R1536 is to place a forward bias on the detector, V1009, to overcome the contact potential of the diode.

The FI-100 potentiometer, R1547, is connected in a voltage divider network with R1548 between +200 volts and ground. The function of R1547 is to adjust the screen voltage of the first two IF amplifiers, V1001 and V1002, and establish the proper logarithmic curve for meter scale tracking.

2.6.6.2 QP-1 and QP-100 Potentiometers. - The QP-1 potentiometer, R1542, is connected to the detector circuit in the Main IF Amplifier when the METER FUNCTION switch, S1513, is set to the QUASI-PEAK position. The potentiometer is connected in a voltage divider network with R1541 and R1543, between -105 volts and ground. The function of R1542 is to place a negative bias on the plate and cathode of the detector, V1009. The purpose of this bias is to balance the cathode follower, V1010, which drives the quasi-peak circuits.

The QP-100 potentiometer, R1537, is connected in the cathode circuit of V1004 when S1513 is set to the QUASI-PEAK position. The potentiometer then adjusts the gain of the Main IF Amplifier in the QUASI-PEAK detector function.

2.6.6.3 DP-100 Potentiometer. - The DP-100 potentiometer, R1538, is connected in the cathode circuit of V1004 when S1513 is set to the DIRECT PEAK position, performing the same function as R1537 (paragraph 2.6.6.2).

2.6.6.4 SP-1 and SP-100 Potentiometers. - The SP-1 potentiometer, R1535, is connected in the detector circuit in the Main IF Amplifier, and the SP-100 potentiometer, R1539, is connected in the cathode circuit of V1004 when S1513 is set to the SLIDEBACK PEAK position. These two potentiometers perform the same functions as R1542 and R1537 respectively (paragraph 2.6.6.2).

2.6.6.5 CAL VOLT BAL Potentiometer. - The CAL VOLT BAL potentiometer, R1551, adjusts the -200 volt source applied to the impulse calibrator. The potentiometer functions to maintain a balance between the -200 and +200 volts used to energize the calibrator.

2.6.6.6 CHOPPER BAL 1 and CHOPPER BAL 2 Potentiometers. - The CHOPPER BAL 1, R1164, and CHOPPER BAL 2, R1163, potentiometers are connected across the two chopper voltage networks (Figure 2-10). The CHOPPER

BAL 1 potentiometer provides a means of balancing the AFC chopper output applied to the Bands 1 and 3 RF Tuners to obtain a frequency shift null when no AFC voltage is present. The CHOPPER BAL 2 potentiometer performs the same function for the Bands 2 and 4 RF Tuners.

2.6.6.7 DISCRIM ZERO Potentiometer. - The DISCRIM ZERO potentiometer, R1549, is connected between the two discriminator outputs across relay K1102 (Figure 2-10). The wiper of the potentiometer applies the signal to the selected AFC chopper circuit and amplifier. The potentiometer functions to balance the AM/FM outputs of the discriminator.

2.6.6.8 NARROW BW GAIN Potentiometer. - The NARROW BW GAIN potentiometer, R1546, is connected between the cathode of V1011 (Figure 2-8) and ground. The potentiometer functions to control the gain of V1011, and permit the gain of the narrowband and wideband IF amplifier stages to be equalized.

2.6.6.9 DYNAMIC RANGE Potentiometer. - The DYNAMIC RANGE potentiometer, R1544, adjusts the screen voltage applied to the push-pull IF amplifiers, V1007 and V1008. This allows the dynamic range of the IF amplifier to be adjusted as desired.

2.7 AUDIO AND VIDEO OUTPUTS

2.7.1 Audio Amplifier. - The first video amplifier output is applied to the grid of the first audio amplifier, V1108A (Figure 2-10), where it is amplified and applied to a stretching network when the METER FUNCTION switch, S1513, is in the DIRECT or SLIDEBACK PEAK positions. This stretches the pulses sufficiently to make them audible. The stretched pulses are then applied through the function switch across the AUDIO potentiometer, R1545. The signal from the arm of R1545 in turn is applied to the grid of V1108B, which drives the push-pull audio output stage, V1109.

2.7.2 Video Stretch Circuit. - The video stretch circuit, consisting of the first half of V1201 (Figure 2-11) in conjunction with the VIDEO STRETCH switch, S1515, furnishes an output for any recorder. Cathode follower V1010B in the Main IF Amplifier (Figure 2-8) applies the video signal to a pulse stretching network consisting of CR1201 and R1202 (Figure 2-11), and a capacitor, C1512, C1513, or C1514 (Figure 2-2), as selected by the VIDEO STRETCH switch. The stretched pulse is then applied to the grid of cathode follower V1201, which provides the low impedance drive to the recorder.

Four time constants are available with the VIDEO STRETCH switch. When the switch is in the 0 position, no stretch is applied and full bandwidth video is available at the STRETCHED VIDEO receptacle, J1521. When the switch is in the 30 μS, 160 μS, or 800 μS position, corresponding degrees of stretch are applied to the video signal so that galvanometers having frequency responses of 5,000 cps, 1,000 cps, and 200 cps, respectively may be used to record the video.

The time constants were derived from the following formula:

Where, TC = Time Constant

and F = frequency response of galvanometer

$$TC = \frac{1}{2\pi F}$$

In operation, the time constant selected should be as long, or longer, than that obtained from the equation.

2.7.3 DC Video. - A direct coupled video output is provided. The video signal from the cathode follower V1010A at J1002 (Figure 2-11), is applied to the grid of cathode follower V1301B (Figure 2-12). A DC balance potentiometer, R1315, permits the DC level at the DC VIDEO output receptacle to be set at J1524.

2.8 IMPULSE GENERATOR

The Impulse Generator (Figure 2-2) is energized when the CAL button, S1518, is pressed to produce a calibration signal (refer to paragraph 2.4.4). The generator produces a constant amplitude wide-band spectral output applied to the RF Transfer, S1524, from J1545.

2.8.1 Generator Operation. - The Impulse Generator consists of two inductances and a floating contact. The contact applies the impulsive signal to the line at J1545 at a rate determined by the pulsing of the two inductances.

2.8.2 Generator Drive Circuit. - When the CAL button is pressed, relay K1511 applies +200 volts to two free-running multivibrators, V1103 and V1104 (Figure 2-10). Multivibrator V1103 operates at a frequency of approximately 20 cps, producing two square waves 180 degrees out of phase on the opposing cathodes. These in turn appear on the two coils of the impulse generator, in series with each cathode to -105 volts. The out-of-phase square waves cause a changing magnetic field to build up and collapse around the coils, causing the contact to vibrate at a rate of approximately 40 cps.

The second multivibrator, V1104, operates at a frequency of approximately 1 cps, causing relay K1103 to switch at this rate. The arm of K1103 is alternately connected to a source of plus or minus 200 volts, which in turn is applied to the vibrating contact in the impulse generator.

2.9 SCAN CHASSIS

The Scan Chassis (Figure 2-13) contains the control circuitry used to tune the unit when the TUNING MODE switch, S1503, is in either the SINGLE or SECTOR SCAN positions. A brief summary of this operation is presented prior to the discussion of the circuitry involved.

2.9.1 Automatic Operation. - When the TUNING MODE switch is set to the SINGLE SCAN position, the unit will scan through the range of the particular RF Tuner selected by the BAND SWITCH, S1506, once only. The direction of scan, and the scanning speed, in this mode are determined by the setting of the SCAN RATE control, R1501.

When the TUNING MODE switch is set to the SECTOR SCAN position the limits of the scan are determined by the position of the BAND SWITCH, the SECTOR CENTER FREQ. control, R1571, and the SECTOR WIDTH control, R1577. For example; with the BAND SWITCH in the FULL RANGE position and the SECTOR WIDTH set to 10 and the SECTOR CENTER FREQ. set to 5.5 the unit will scan up to 10 Gc, reverse and scan back down to 1.0 Gc, then reverse, etc. However, if the SECTOR CENTER FREQ. is set to say 1.5 Gc and the SECTOR WIDTH to 0.5 (500 Mc), the unit will scan from 1.25 to 1.75 Gc, then reverse, etc.

2.9.2 Bandswitch. - The BAND SWITCH, S1506, has five positions, corresponding to the four RF Tuners, and a FULL RANGE position for automatic band changing during scanning. The manually operated bandswitch in turn controls the "slaved" switch, S1701, which is driven by a Ledex stepping motor.

2.9.3 Ledex Operation. - The Ledex is a detented bi-directional stepping motor. Its operation can best be described by the following example:

2.9.3.1 Clockwise Rotation. - Assume the unit is set in Band 1 and it is desired to switch to Band 3. When the BAND SWITCH is set to the BAND 3 position, -28 volts is applied between the wiper, 7, and the contact 3 of S1506A to contact 3 on the Ledex control section, S1701G. This section has two wafers, front and back, which are insulated from each other. Each wafer has its own wiper, 7 for the front, and 8 for the back. The contacts, 1 thru 4, however are common to both wafers.

The -28 volts is picked off the front wafer wiper, 7, and applied through the de-energized contacts, 1 and 9 and 2 and 10, of relay K1711 to the clockwise solenoid of the Ledex. This in turn pulses the Ledex to revolve clockwise one position (to Band 2). The Ledex will continue to draw current from the -28 volts, but will not move to the Band 3 position until it is pulsed again. The current flow through diode CR1704 however causes relay K1710 to energize at this time, closing contacts 7 and 11 to apply +375 volts through R1703 to the coil of K1711.

Relay K1711 then energizes to interrupt the -28 volts to the Ledex solenoid. The rate of uplsing K1711 is set by the time constant of R1703 and C1701, after which the -28 volts is again applied to pulse the Ledex to the Band 3 position. At this time the open position of S1701G has moved under contact 3 to interrupt the -28 volt stepping voltage.

2.9.3.2 Counterclockwise Rotation. - The reverse operation, placing the BAND SWITCH in the BAND 1 position, applies the -28 volts through contact 1 of S1701G to the back wafer wiper, 8, then through the de-energized contacts of K1711 to the counterclockwise solenoid of the Ledex. Again, the Ledex is pulsed and moves to the Band 2 position. The current flow through diode CR1703 energizes K1710 and K1711 as in the clockwise sequence, again pulsing the Ledex to the Band 1 position where it shuts off.

2.9.3.3 Bandswitch Functions. - The "slaved" switch, S1701, has eight sections, each performing specific functions during the band changing operation. The S1701A section has two sections; pin 8 to 11 supplying the clutch engaging voltage to the tuners in the SINGLE or SECTOR SCAN modes of operation. Pins 2 to 5 applies the limit common voltage to the TUNING MODE switch, S1503A. The S1701B section again has two sections; pins 8 to 11 applies -28 volts to diode CR1701 and the motor control line. Pins 2 to 5 applies the motor control voltage to the appropriate tuner. The S1701C section also has two sections; pins 7 to 10 applies +28 volts to diode CR1702 and the motor control line.

The S1701D section also has two sections; pins 8 to 11 applies +200 volts to the appropriate tuner, pins 2 to 5 applies 6.3 volts AC to the dial light in the appropriate tuner. The S1701E wafer; pins 8 to 11 applies +28 volts to energize relay K1101 in the Bands 1 and 3 position (paragraph 2.5.2). Pins 1 to 4 applies +28 volts to actuate the klystron repeller voltage relay, K1712, K1713, K1718, or K1719, for the tuner in use.

The S1701F section also has two sections; pins 8 to 11 applies -28 volts to energize the RF Transfer, S1524 (paragraph 2.2); pins 2 to 5 applies a ground to actuate the appropriate selector, S1522 or S1523, and Band Selector, S1512. The S1701G section is the Ledex control wafer (paragraph 2.9.3.1). The S1701H section has a single wafer and applies the digital potentiometer output from the selected tuner (in the FULL RANGE position) to the SECTOR SCAN control tube, V1501.

2.9.4 Tuning Mode Selection. - The TUNING MODE switch, S1503, has three positions, MANUAL, SINGLE SCAN, and SECTOR SCAN. In the MANUAL position, the RF Tuners are controlled by the dial drive on the front panel. However, in the SINGLE and SECTOR SCAN positions, they are controlled by the tuning motors in the individual tuners. A description of the Band 1 Tuner (Figure 2-3) drive assembly is presented as typical of all four tuners.

2.9.4.1 Tuning Drive Assembly. - The pre-selector, coaxial cavity resonator, and three potentiometers, are ganged to the tuning drive. An electromagnetic clutch, MP101, couples the tuning drive to the motor, B101, in the SINGLE and SECTOR SCAN mode. Two microswitches, S101 and S102, are actuated by a cam on the drive assembly to close at the high and low frequency limits respectively.

2.9.4.2 SINGLE SCAN Operation. - When S1503 (Figure 2-13) is set to the SINGLE SCAN position the clutch in the selected tuner is energized and the motor is connected to the wiper of the SCAN RATE potentiometer, R1501.

The SCAN RATE potentiometer and microswitches S1504 and S1505 form the SCAN RATE control assembly. The two microswitches are actuated by cams on the shaft of R1501. In the mid-point (OFF) position of R1501, switch S1505 is open. At this point no voltage is applied to the motor. When R1501 is rotated counterclockwise (toward LOW FREQ) and increasingly negative voltage is applied to the motor. Similarly, when R1501 is rotated clockwise (toward HIGH FREQ) an increasingly positive voltage is applied to the motor.

The polarity of the applied voltage is determined by the position of switch S1504. When the switch is in the HIGH FREQ position, +28 volts is applied to the limit common bus, while in the LOW FREQ position, -28 volts is applied to the bus. The +28 volts (increase frequency) is applied through the de-energized contacts of the appropriate high limit relay, switch S1701C, diode CR1702, switch S1503A, relay K1709, and the contacts of S1505 across R1501. Similarly, the -28 volts (decrease frequency) is applied through the de-energized contacts of the appropriate low limit relay, S1701B, and diode CR1701 to the remainder of the motor control circuit. Relays K1701, K1703, K1705, and K1707, are the low limit relays for Bands 1 through 4 respectively, while K1702, K1704, K1706, and K1708, are the high limit relays.

Assume in Band 1 that the frequency is decreasing. At the lower limit microswitch S102 (Figure 2-3) closes. This applies 28 volts from the limit common bus to energize K1701 (Figure 2-13). This in turn opens the 28 volt motor voltage circuit to stop the drive at the lower limit.

2.9.4.3 SECTOR SCAN Operation. - The unit may be opened in the SECTOR SCAN mode to scan within a single band, or to scan through the entire range, or a portion thereof, depending on the setting of the BAND SWITCH, S1506, SECTOR CENTER FREQ control, R1571, and SECTOR WIDTH control, R1577.

The SECTOR CENTER FREQ and SECTOR WIDTH controls function in conjunction with each other to establish two reference voltage levels that control the range covered by the tuners, this is accomplished as follows.

2.9.4.3.1 Scan Limit References. - The SECTOR CENTER FREQ control consists of two ganged ten-turn potentiometers, R1571A and B. The two potentiometers are connected in series networks between +200 and -7 volts. The wipers of these two potentiometers in turn are connected together in a series network consisting of the two ganged ten-turn SECTOR WIDTH potentiometers, R1577A and B, and two balancing potentiometers, R1717 and R1719.

The wipers of R1577A and B are in turn connected to opposing contacts on relay K1716 in the plate return of V1501B. The arm of this set of contacts

is connected to the grid of V1501A. The tube functions as a differential amplifier, with the coil of K1716 as the load. With K1716 de-energized, the voltage at the grid of V1501A represents the upper frequency limit for the scan, and when energized represents the lower frequency limit.

2.9.4.3.2 Tuner Frequency Voltage. - Each of the four RF Tuners has a digital potentiometer ganged to the tuning drive assembly. The digital potentiometer is part of a series network connected to +200 volts. These networks are balanced so the lowest range of voltage appears across the Band 1 tuner, the next highest across the Band 2 tuner, etc. In this manner, the voltage picked off by the wiper of the digital potentiometer represents a particular frequency between 1.0 and 10 Gc.

2.9.4.3.3 Control Tube Operation. - The control tube, V1501, compares the tuner voltage with the particular scan level reference applied. If the reference voltage is greater than the tuner voltage, K1716 is de-energized and +28 volts is applied to the tuner motor through the de-energized contacts of K1501, causing the tuner to increase in frequency.

At the voltage cross-over point, K1716 is energized, in turn energizing K1501. This reverses the polarity on the tuner motor, causing it to sweep down in frequency, and also applies the lower scan limit reference voltage to the grid of V1501. Relay K1716 will then remain energized until the lower scan limit is reached and flip over to start the upward scan again.

2.9.4.3.4 Automatic Band Changing. - If the scan limits established by the SECTOR CENTER FREQ and SECTOR WIDTH control settings exceed the range of a single tuner, the BAND SWITCH must be set to the FULL RANGE position. If this is not done, the SECTOR SCAN will be limited to that portion that falls within the range selected by the BAND SWITCH.

Placing the BAND SWITCH in the FULL RANGE position energizes relay K1717 (and K1709 when in SECTOR SCAN). Relay K1717 transfers the manual functions performed by S1506A (paragraph 2.9.3) to the limit relays. This permits the limit relays to perform the band change stepping function in sequence as the unit scans through more than one band.

Relay K1714 is energized from +28 volts when the Band 4 high limit relay, K1708, is actuated. It is then latched "on" to +28 volts through the de-energized contacts of the Band 1 low limit relay, K1701. In the energized state, K1714 applies -28 volts through K1709 (energized in SECTOR SCAN) to the tuner motor control circuit. This reverses the motor and drives the tuner down in frequency. If the lower frequency limit, set by the SECTOR WIDTH control, is above 1.0 Gc relay K1715 functions as the limit interrupt relay, rather than K1701. Relay K1715 is energized momentarily by a pulse when K1716 de-energizes, in turn de-energizing K1501 to apply +28 volts to the motor control circuit, driving the tuner back up in frequency.

2.9.4.3.5 Transient Blanking. - A transient blanking circuit is incorporated to drive the Y-axis pen of the X-Y recorder negative during the band changing operation. Cathode follower V1502A has its grid connected via the de-energized contacts of K1720 to the cathode of meter amplifier V1105 (Figure 2-10). The output from the cathode of V1502A is applied through zener diode CR1705 to the Y-analog output of the X-Y ANALOG receptacle, J1503. Relay K1720 is pulsed to actuate momentarily during the band changing operation. When this occurs the grid is connected to the junction of R1720 and R1721, which form a voltage divider from the +28 volts. This produces a positive going pulse at the cathode, which in turn is applied through CR1705 to the Y-analog output. The X-Y recorder sees this as a negative input, and the Y-axis pen is driven negative as a result. Relay K1720 is actuated by either a -105 or +105 voltage, depending on the state of relays K1704, K1705, and K1709.

2.10 POWER SUPPLY

The Power Supply unit of the NM-62B provides all operating voltages for the complete equipment. The power supply will operate from either a 115 or 230 volt, 50 to 60, or 400 cps source.

The Power Supply unit provides the following output voltages to the RFI Measuring unit:

a) 6.3 volts AC (regulated)

b) + and -28 volts

c) +200 volts (regulated)

d) +375 volts

e) - 105 volts (regulated)

f) - 650 volts (regulated)

g) - 1610 volts (regulated)

In addition, the power supply unit contains a +20 volt regulated supply to provide operating voltages for internal circuits within the power supply itself. The power supply is shown on the schematic diagram, Figure 2-14.

2.10.1 Power Input Circuit. - The AC input voltage (115 of 230 volts) is applied at the POWER INPUT receptacle, P1602. Both legs of the single-phase input are fused, and the power is applied through a line filter, Z1501, to the 115/230 V selector switch, S1601, and across a half-wave rectifier circuit composed of diode CR1601 and capacitors C1601 and C1602. The DC output of CR1601 is applied through the POWER switch, S1501, to energize relay K793. Relay K793 completes the return line through the 115/230 V selector switch. The 115/230 V selector switch in turn connects the dual primary windings on each of the four

power transformers, T701, T771, T801, and T901, in parallel for a 115 volt input, or in series for a 230 volt input.

2.10.2 6.3 Volt AC Regulated Supply. - The 6.3 volt AC regulated supply provides all heater voltages for the NM-62B. The 9 volts AC across the secondary winding, pins 11 and 12, of T701 is applied to transistors Q707 and Q708, where it is clipped to an RMS value of 6.3 volts.

The 6.3 volt AC signal appears across the primary of T702 to develop the control signal. The voltage across the secondary of T702 is rectified by diodes CR701 and CR702 and applied across R737, to provide a reference level at the base of Q701. The level is temperature compensated by thermistor RT701. The reference level is amplified by Q701 through Q705, and applied as a control level to the clipping transistors, Q707 and Q708.

The 6.3 volt regulated AC output is balanced by R738, and the level adjusted by R739. The 6.3 volt regulated AC output appears at the paralleled terminals 15 and 16 of TB1601, and is fused by F1504 and F1505. The fused 6.3 volt AC outputs are applied to the power cable at pins L and M of receptacle P1601, with the return at the common pins, J and K.

2.10.3 - 105 Volt Regulated Supply. - The voltage across the secondary windings, pins 1 and 3, of T701 is rectified by diodes CR751 and CR752 and applied to a series limiting transistor, Q751. The base to emitter voltage of Q751 is regulated by V701 to provide a reference, while the base to collector voltage is referenced by CR755.

The - 105 volt output level is adjusted by R752, and is fused by F1506. The fused - 105 volt output is applied to the power cable at pin D of receptacle P1610, with the - 105 common at pin N.

2.10.4 28 Volt DC Supplies. - The + and - 28 volt outputs are obtained from diodes CR772 and CR771 respectively. The two diodes are connected to the secondary winding of T771, and the output voltages are filtered by capacitors C771 and C772. The - 28 volt output is applied through terminal 20 of TB1601 to pin P of receptacle P1601. The +28 volt output is applied through terminal 27 of TB1601 to pin R of P1601, and also to the heater of the time delay relay, K791.

2.10.5 +20 Volt Supply. - The voltage across the secondary winding, pins 8 and 11, of T801 is applied to a full-wave bridge rectifier consisting of diodes CR817, CR818, CR819, and CR821. The output of the rectifiers is applied through potentiometer R826, which establishes the voltage regulation level. The +20 volt output is fused by F1507 and applied to the collectors of the two, series regulating transistors, Q801 and Q802. The output of the series regulator is applied across a voltage divider network consisting of R805, R807, and potentiometer R825. The level at the wiper of R825 is applied to the base of Q804, which has its emitter

level referenced by CR803. The output of Q804 is amplified by Q803, and used to supply the control bias to Q801 and Q802. The output of the +20 volt supply is applied as the collector source for operation of the 6.3 volt AC regulator, and also to the high-voltage supply.

2.10.6 +200 Volt Regulated Supply. - The voltage across the secondary winding, pins 5 and 6, of T901 is applied to a full-wave bridge rectifier consisting of diodes CR911 through CR914. The output of the rectifier is +375 volts, which is filtered by C901 and applied to the +200 volt regulator, and also to the +375 volt output to the power cable at pin U of receptacle P1601.

The +200 volt regulator consists of series regulators V901 through V903. The output of the series regulators is applied across a voltage divider network consisting of R917, R920, and potentiometer R916. The level at the wiper of R916 is applied to the grid of V904, which has its cathode level referenced by V905. The output of V904 is used to supply the control signal applied to the grids of V901 through V904. The +200 volt output of the regulator is applied to the thermal time delay relay, K791, before being applied to the power cable at pin C of receptacle P1601.

2.10.7 Time Delay Circuit. - A one-minute time delay occurs after the power is initially switched "on" before the +200 volt output is applied to the system. At this time, the high-voltage supply is also activated to apply the -650 and -1610 volt outputs to the klystrons in the RF Tuners. The time delay is accomplished with a thermal relay, which has its heater connected across the output of the +28 volt supply.

Once K791 closes, it applies +200 volts to the power cable, and also through R791 to energize relay K792. Relay K792 performs two functions; (1) it applies a ground to the READY light to show that the system is ready for operation, and (2) it also applies +28 volts to energize relay K801 in the high-voltage supply.

2.10.8 High-Voltage Supply. - The -650 and -1610 volt klystron repeller voltages are developed by the high-voltage supply. This supply is a DC-to-DC converter having two outputs, -650 and -960 volts respectively, which are added to develop the -1610 volt output.

Transistors Q805 and Q807 function in a switching circuit operated from the +20 volt supply. The switching circuit is turned "on" when relay K801 is energized by +28 volts from K792. This removes the +20 volt level at the base of Q805 and allows switching to start.

The two high-voltage windings of T802 are connected to full-wave bridge rectifier circuits, with diodes CR807 through CR810 developing the -960 volt output, and CR812 through CR815 developing the -650 volt output. The two outputs are added across the network R820, R822, and R823, with the -1610 volts applied to the power cable at pin T of P1601, and the -650 volts at pin V.

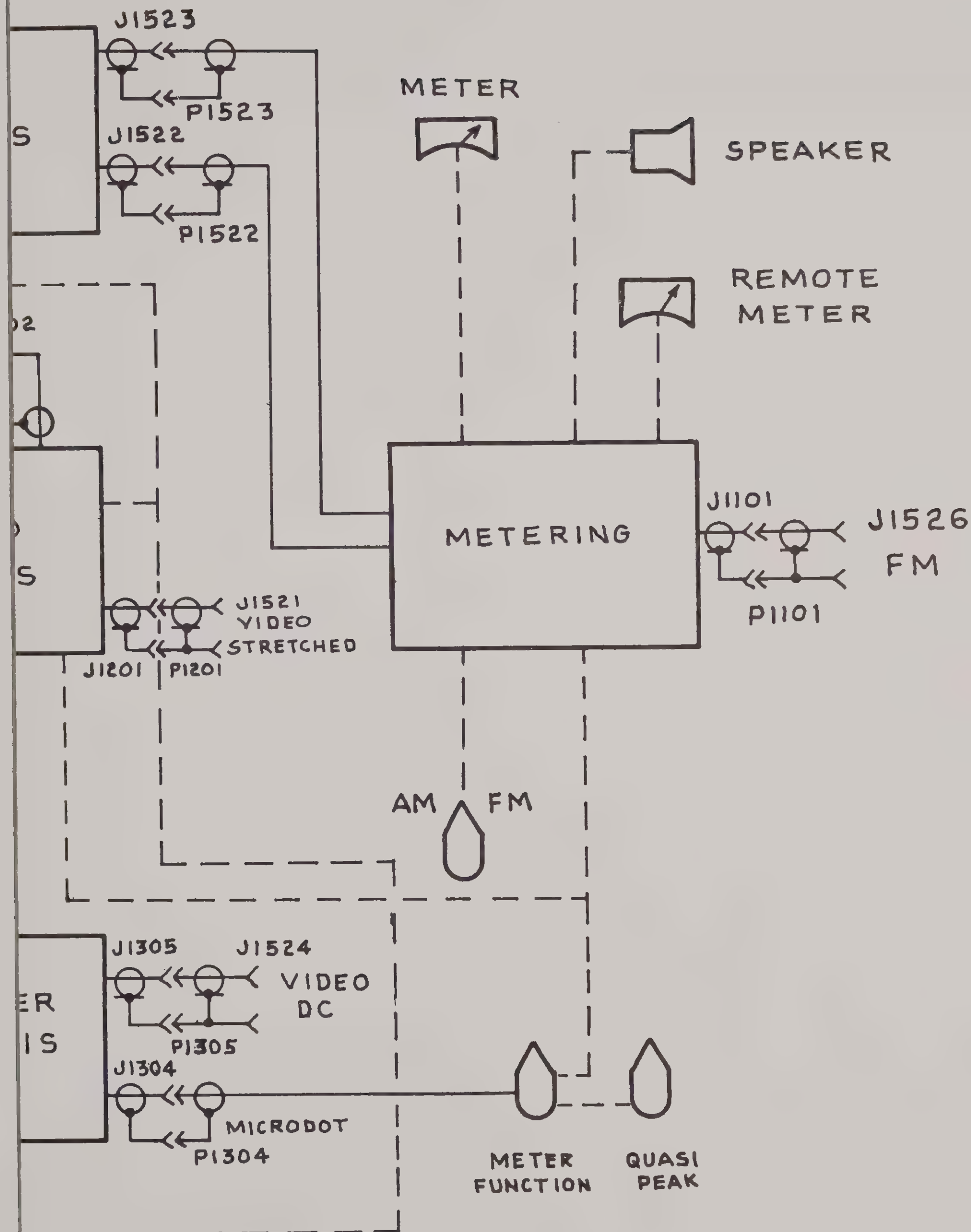
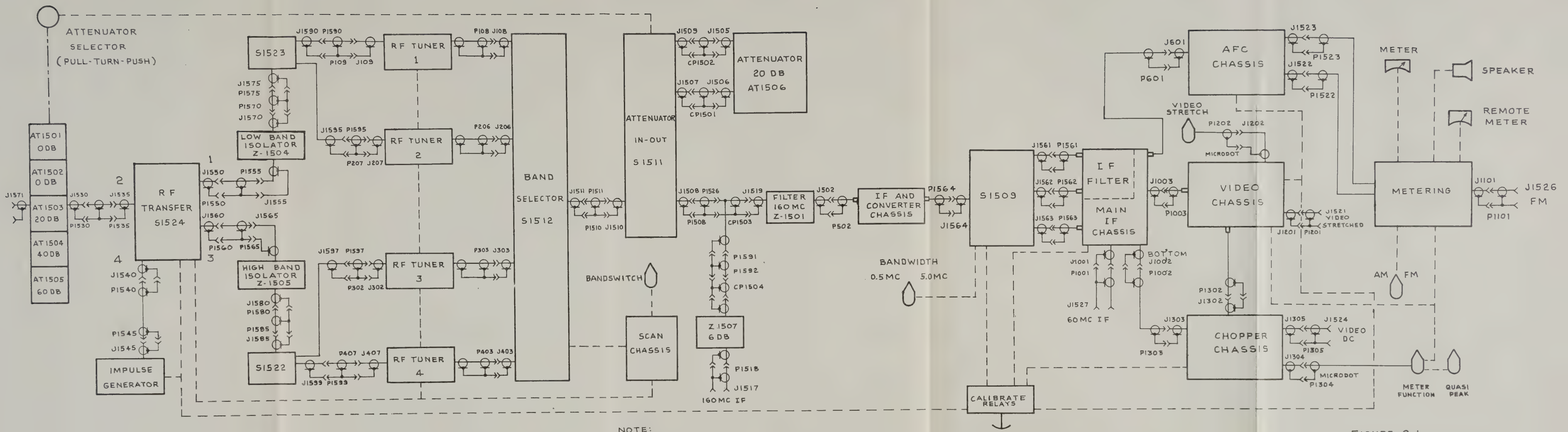
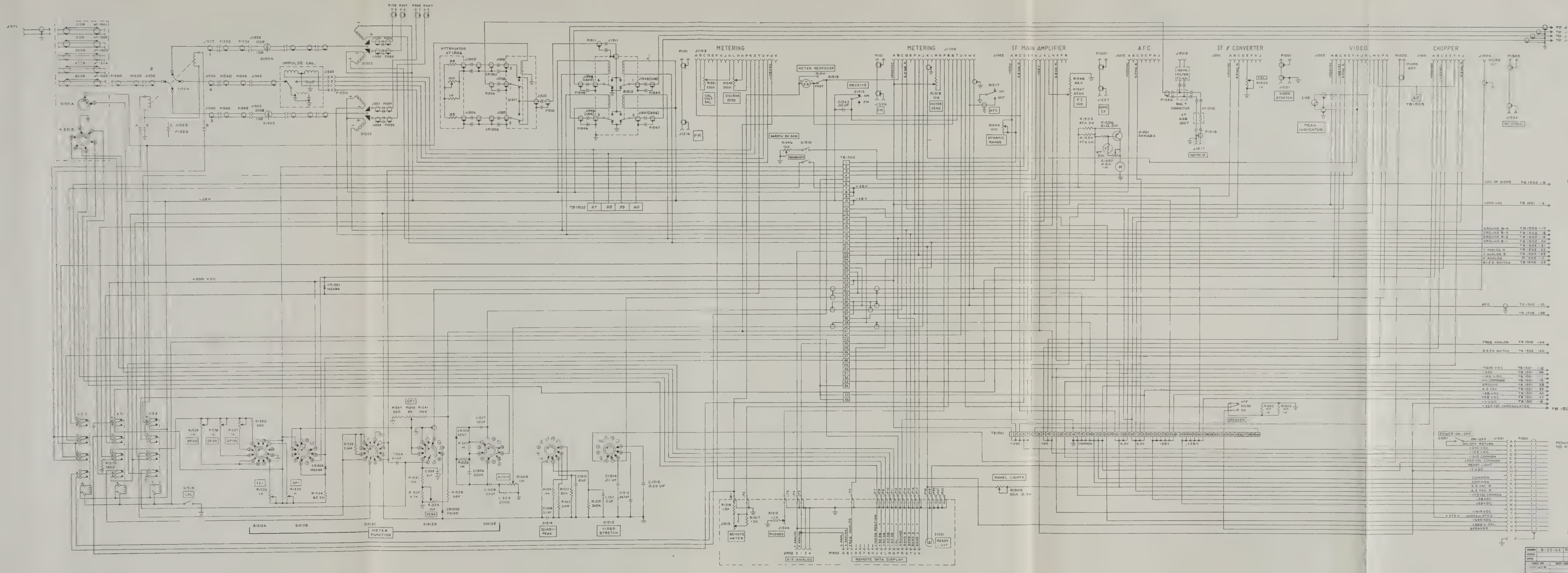


FIGURE 2-1
BLOCK DIAGRAM, NM-62B
18264-D



NOTE:
ELECTRICAL — — — —
MECHANICAL ——·——

FIGURE 2-1
BLOCK DIAGRAM, NM-62B
18264-D



NOTES:

1 UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE 1/2 WATT 5%
ALL CAPACITORS ARE IN PICO-FARADS

2 THE METER FUNCTION SWITCH, S1513, IS SHOWN IN THE FIELD INTENSITY (F I) POSITION. THIS IS THE EXTREME CLOCKWISE POSITION AS VIEWED FROM THE REAR. THE FUNCTIONS, IN SUCCESSIVE COUNTER-CLOCKWISE POSITIONS, ARE AS FOLLOWS

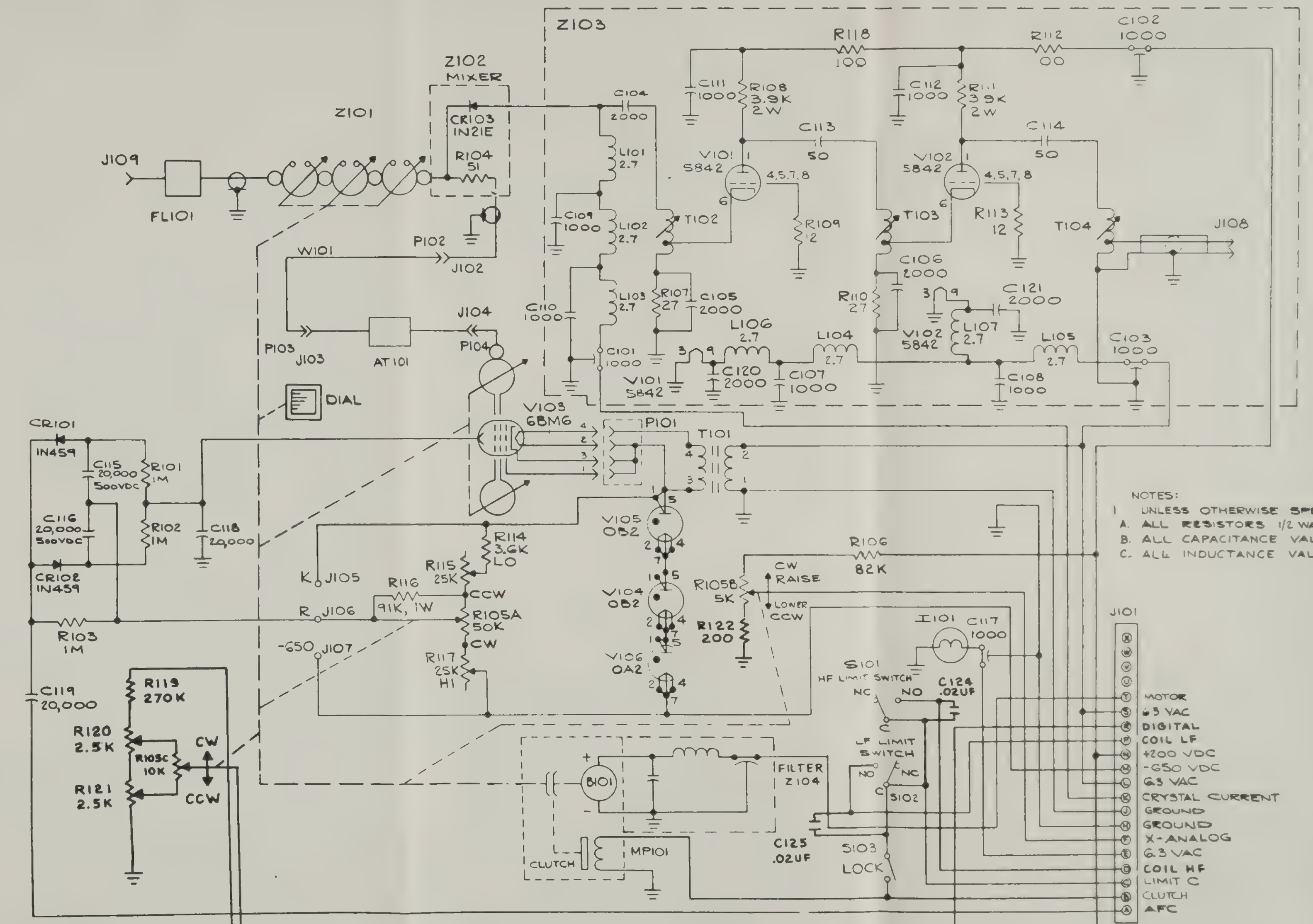
QUASI PEAK - QP
DIRECT PEAK - DP
SLIDEBACK PEAK - SP
METER ZERO

3. C-1520 THRU C-1542 ARE 1000 PF FEED THRU CAPACITORS, USED ON JP-1 TO J-P-22

4. ALL TB NUMBERS CONNECT ON FIG. 2-18

FIGURE 2-2

DRAWN	9-25-63	R J	STODDART TAMAR ELECTRONICS, INC LOS ANGELES, CALIF	
CHECK			SCHEMATIC DIAGRAM, INTERCONNECTING WIRING, NM628	
APPD				
USED ON: NM 628	NEXT ASSY			
APPROVED				
APPROVED			CODE IDENT NO. 78591	SIZE E
			18261	REV
DO NOT SCALE DRAWING			SCALE	WEIGHT	SHEET



NOTES:

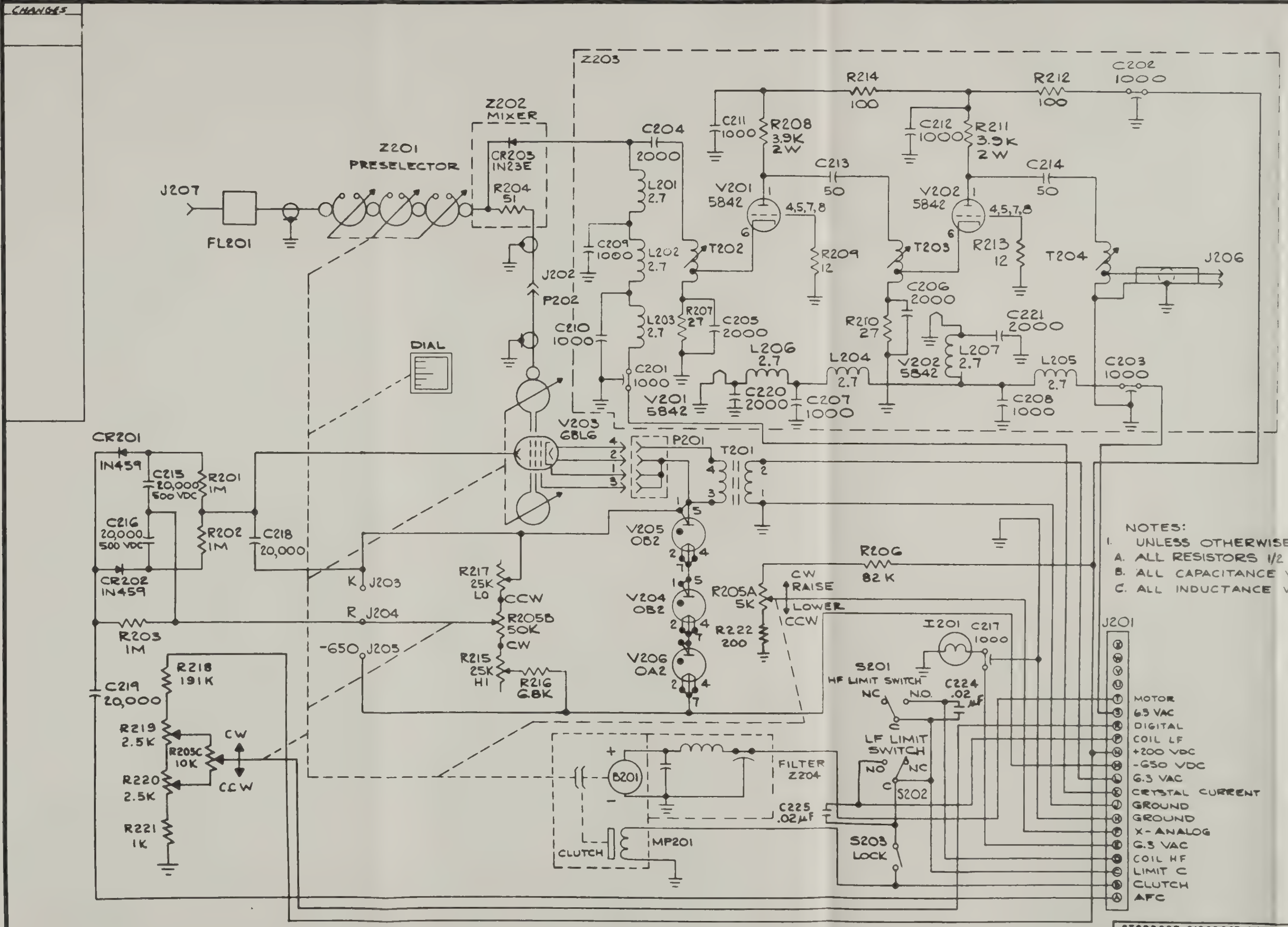
1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTORS 1/2 WATT, ±5%; RESISTANCE VALUES IN OHMS
   B. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.
   C. ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

FIGURE 2-3 , SCHEMATIC DIAGRAM
BAND I RF TUNER

PART NUMBERS	NAME
	SCHEMATIC DIAGRAM

STODDART AIRCRAFT RADIO CO. INC
HOLLYWOOD 38, CALIFORNIA

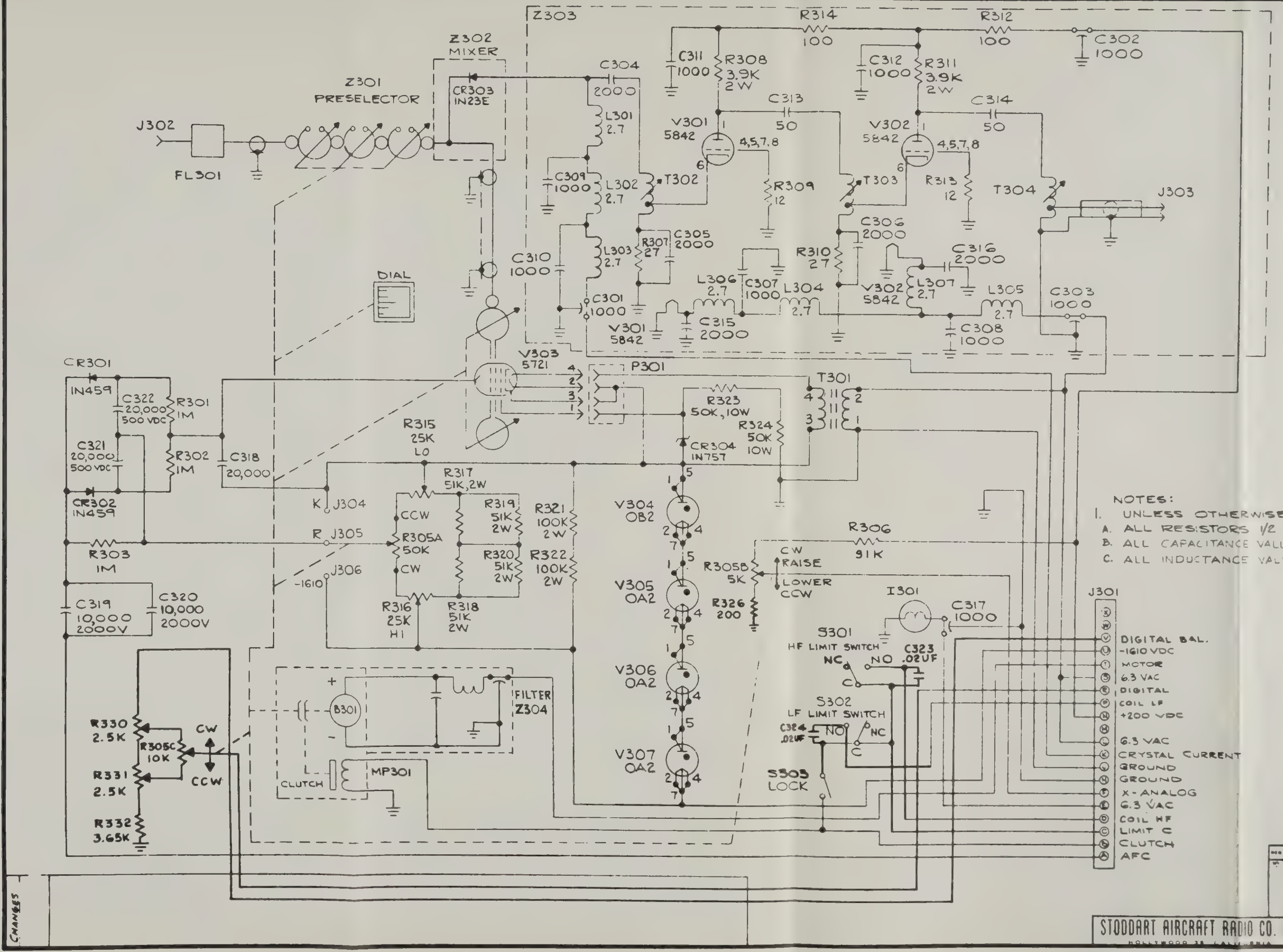
B 18190



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTORS 1/2 WATT, ±5%; RESISTANCE VALUES IN OHMS.
B. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.
C. ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

FIGURE 2-4, SCHEMATIC DIAGRAM - BAND II RF TUNER

NAME	SCHEMATIC DIAGRAM
STODDART AIRCRAFT RADIO CO. INC. HOLLYWOOD 38, CALIFORNIA	B 18189



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTORS 1/2 WATT, ±5%; RESISTANCE VALUES IN OHMS.
B. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
C. ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

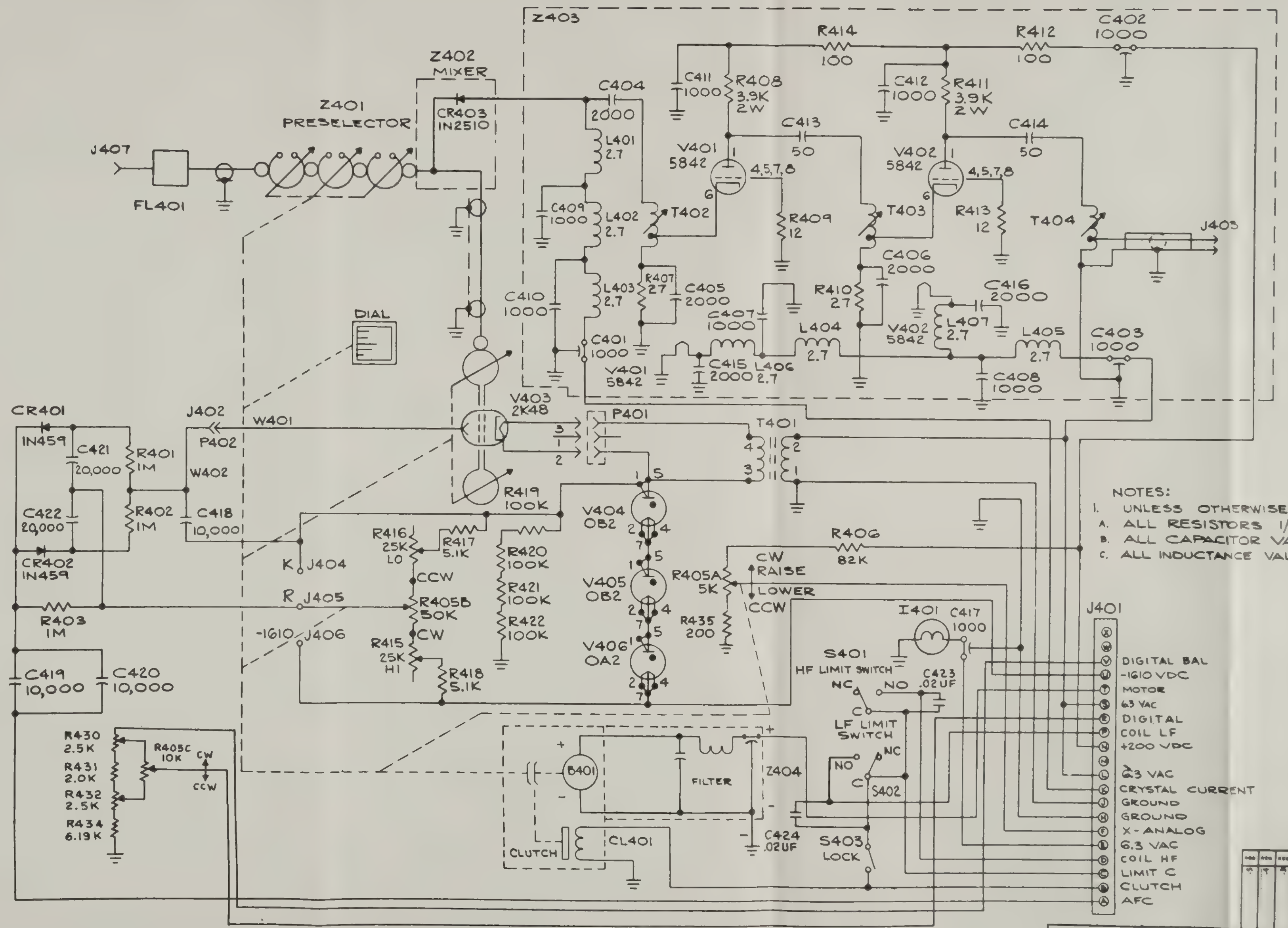
FIGURE 2-5 , SCHEMATIC DIAGRAM
BAND III RF TUNER

SCHEMATIC DIAGRAM

STODDART AIRCRAFT RADIO CO. INC.

B 18688

CHANGES



NOTES:

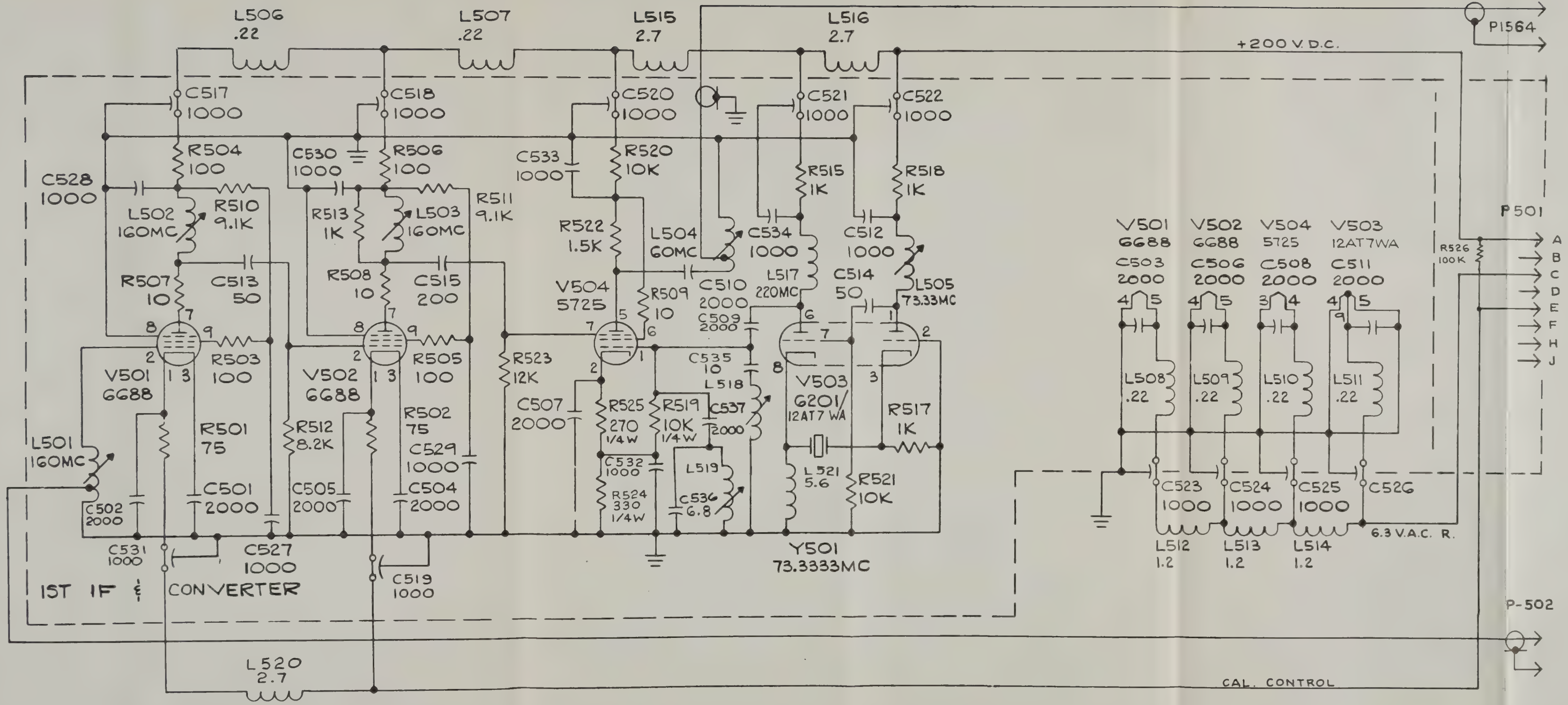
1. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTORS 1/2 WATT, ±5%., RESISTANCE VALUES IN OHMS
   B. ALL CAPACITOR VALUES IN PICOFARADS
   C. ALL INDUCTANCE VALUES IN MICROHENRIES.

FIGURE 2-6, SCHEMATIC DIAGRAM - BAND IV RF TUNER

PART NUMBERS	NAME
	SCHEMATIC DIAGRAM

STODDART AIRCRAFT RADIO CO. INC.
HOLLYWOOD 38 CALIFORNIA

B 18254



NOTES:
UNLESS OTHERWISE SPECIFIED:

A- ALL RESISTORS 1/2 WATT 5%

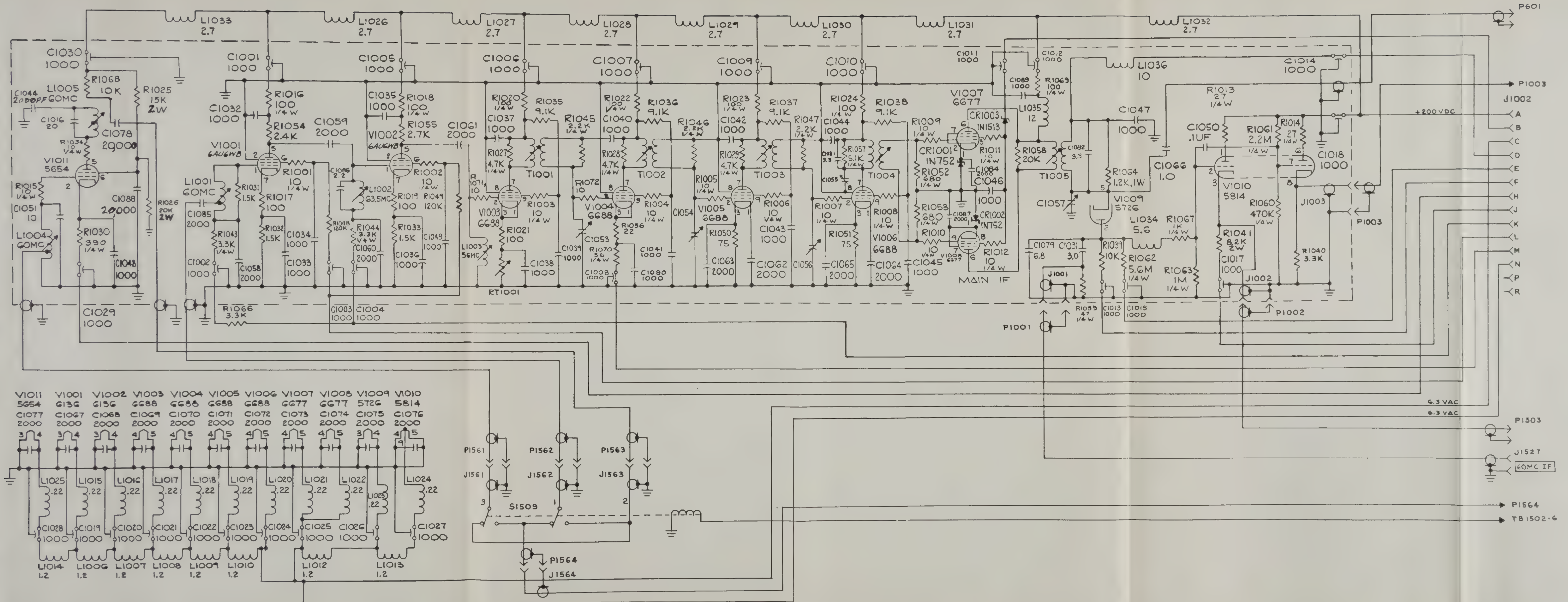
B- ALL CAPACITORS PICOFARAD

C- ALL INDUCTANCES MICROHENRIES

FIGURE: 2-7

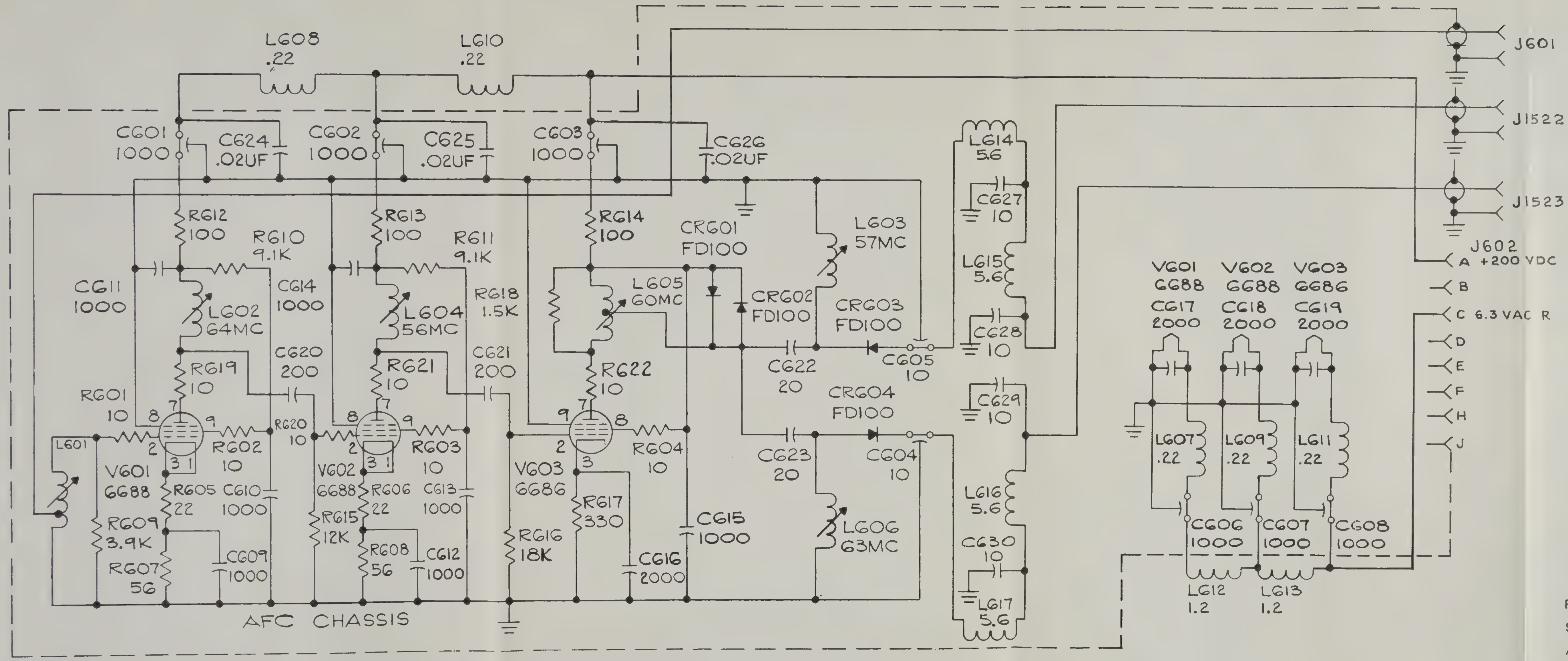
SCHEMATIC DIAGRAM, 1ST IF & CONVERTER CHASSIS, NM62 B

18260-B



NOTES: UNLESS OTHERWISE SPECIFIED:
A- ALL RESISTORS ARE 1/2 WATT 5%
B- ALL CAPACITORS ARE PICOFARADS
C- ALL INDUCTORS ARE MICROHENRIES

FIGURE 2-8
SCHEMATIC DIAGRAM, 60MC
I.F. MAIN AMPLIFIER; NM62B
18259-E



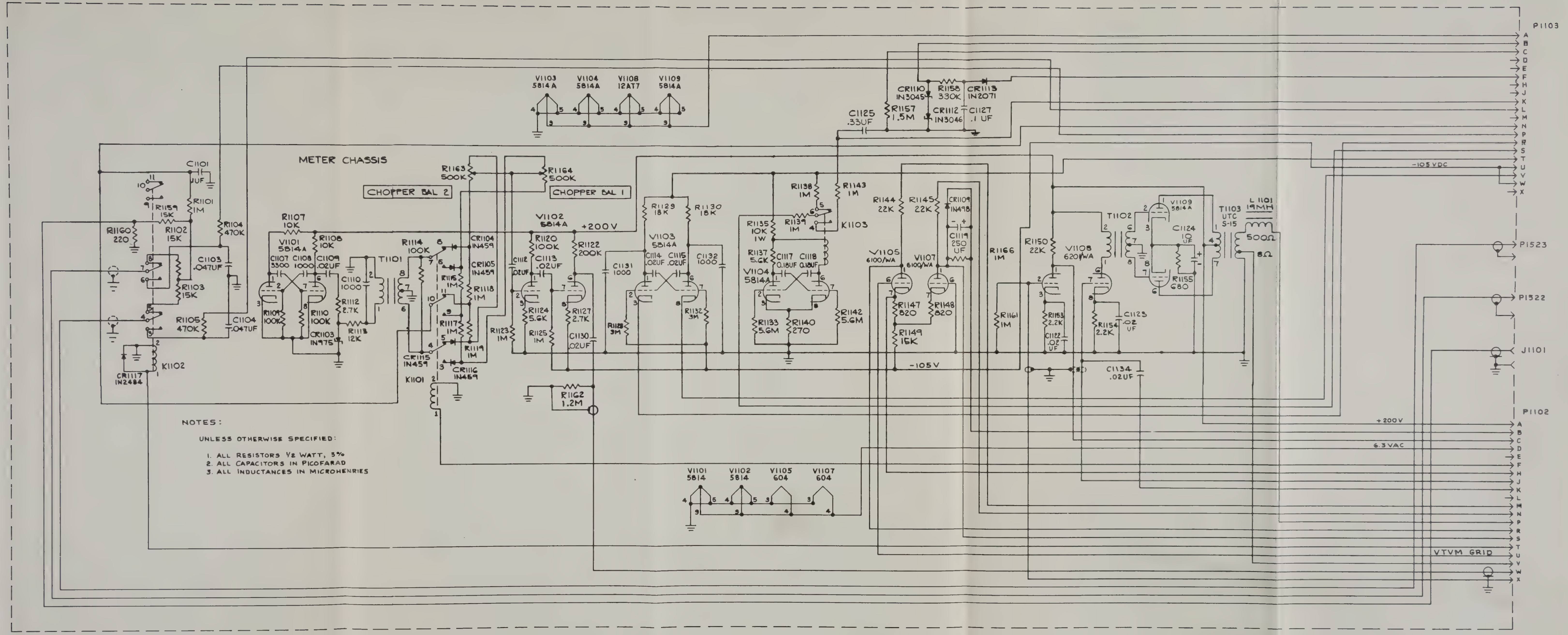
NOTES: UNLESS OTHERWISE SPECIFIED:

A- ALL RESISTORS ARE 1/2 WATT 5%

B- ALL CAPACITORS ARE PICOFARAD

C- ALL INDUCTANCES ARE MICROHENRIES

FIGURE 2-9
SCHEMATIC DIAGRAM,
AFC CHASSIS - NM-62B
18263-B



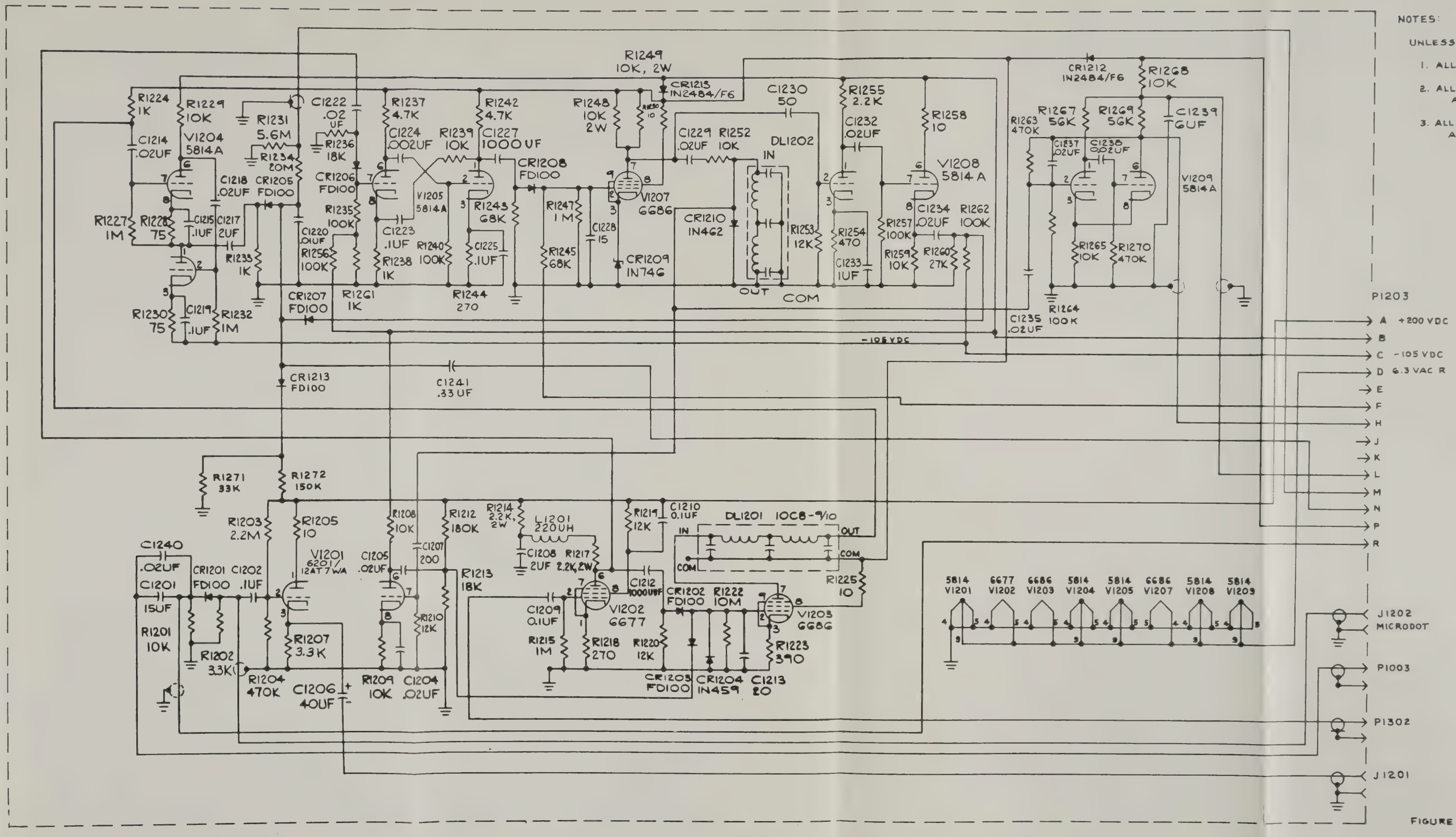
NOTES:

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS 1/2 WATT, 5%
2. ALL CAPACITORS IN PICOFARAD
3. ALL INDUCTANCES IN MICROHENRIES

FIGURE 2-10

SCHEMATIC DIAGRAM
METERING CHASSIS,
NM-62B 18255-E



NOTES:

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ½ WATT
2. ALL CAPACITANCE VALUES ARE PICO FARADS
3. ALL INDUCTANCE VALUES ARE MICROHENRIES

FIGURE 2-11

SCHEMATIC DIAGRAM, VIDEO CHASSIS, NM-62B 18256-D

NOTES: UNLESS OTHERWISE SPECIFIED:

1- RESISTANCE VALUES ARE IN OHMS.
2- RESISTORS ARE 1/2 WATT
3- CAPACITORS ARE IN MICROFARADS

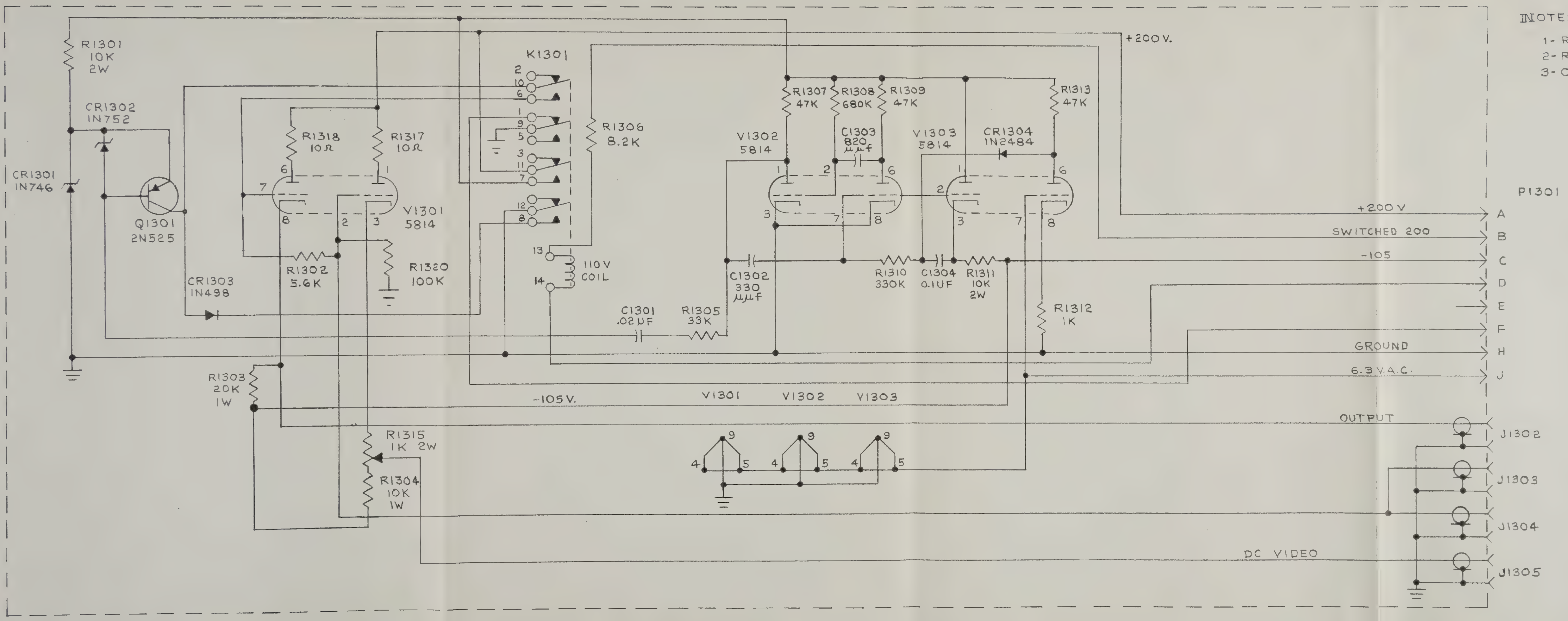
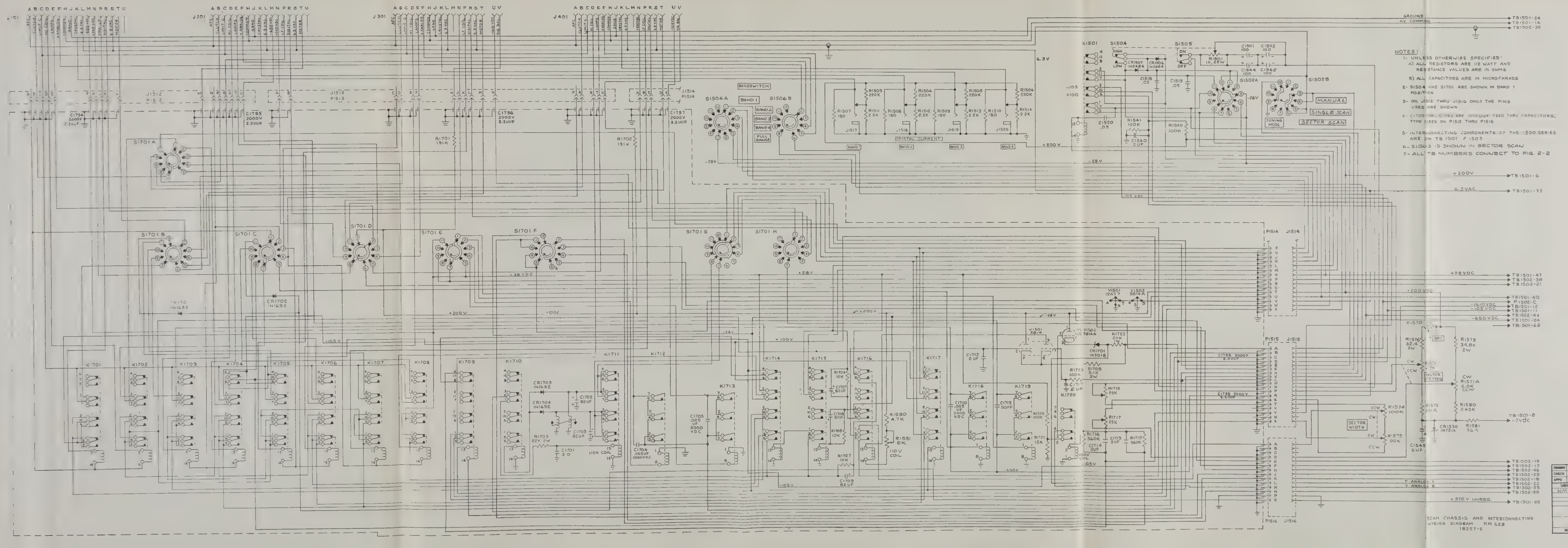


FIGURE 2-12.

SCHEMATIC DIAGRAM, CHOPPER CHASSIS, NM-62B 18262-B

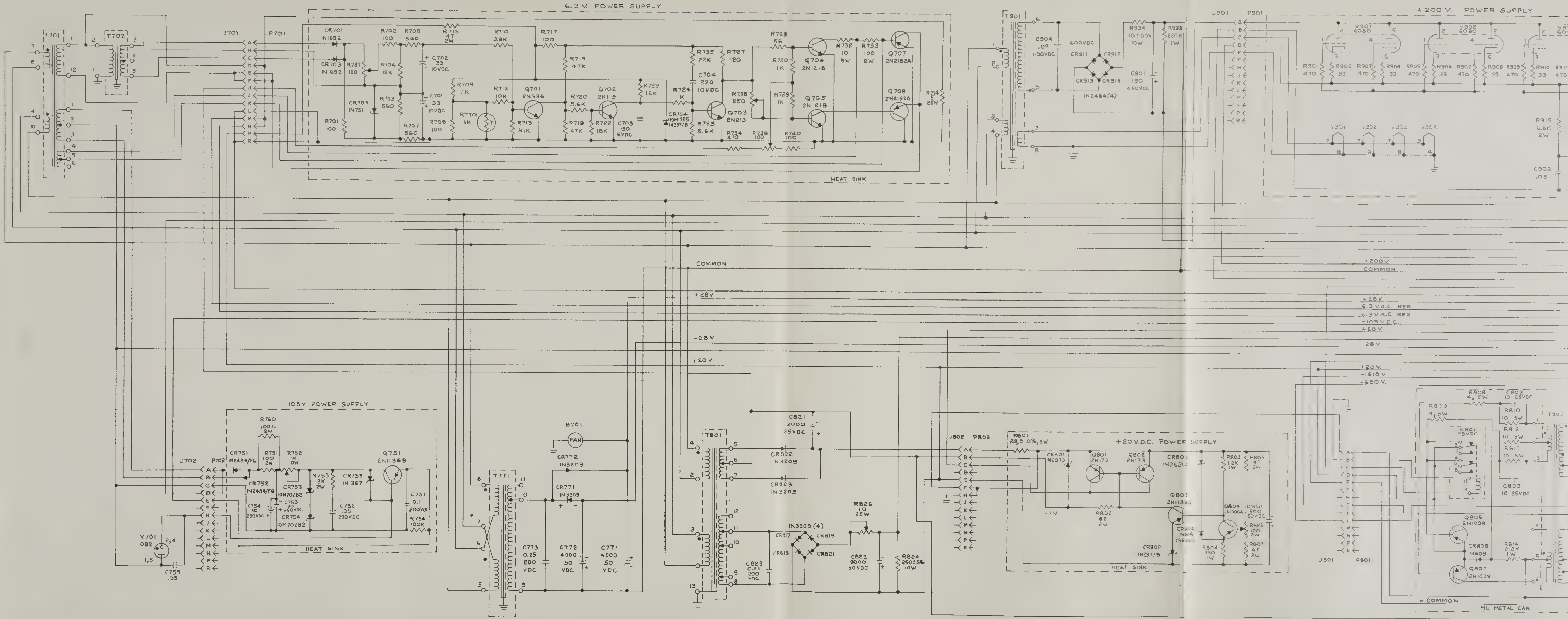


NOTES:

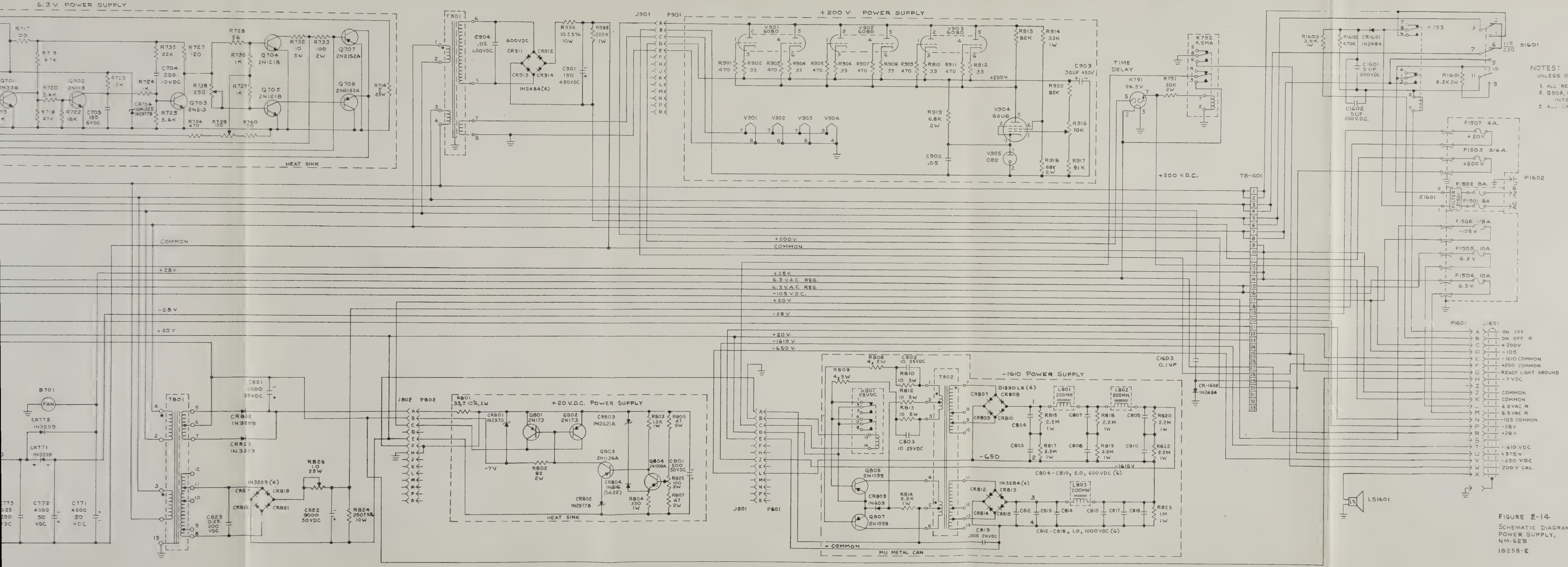
1- UNLESS OTHERWISE SPECIFIED:
   A) ALL RESISTORS ARE 1/2 WATT AND RESISTANCE VALUES ARE IN OHMS
   B) ALL CAPACITORS ARE IN MICROFARADS
2- S1504 AND S1701 ARE SHOWN IN BAND 1 POSITION
3- ON J1512 THRU J1516 ONLY THE PINS USED ARE SHOWN
4- C1720 THRU C1793 ARE 1000UUF FEED THRU CAPACITORS, TYPE USED ON P1512 THRU P1516
5- INTERCONNECTING COMPONENTS OF THE 1500 SERIES ARE ON TB 1501 & 1503
6- S1503 IS SHOWN IN SECTOR SCAN
7- ALL TB NUMBERS CONNECT TO FIG. 2-2

FIGURE 2-13

DRAWN	9-25-63	R.J.	**STODDART** TAMAR ELECTRONICS, INC LOS ANGELES, CALIF
CHECK			SCHEMATIC DIAGRAM, SCAN CHASSIS & INTERCONNECTING WIRING DIAGRAM NM-62B
APPD			
USED ON: NM-62B	NEXT ASSY		
APPROVED			CODE IDENT NO. 78591 — SIZE E — 8257 — REV
APPROVED			
DO NOT SCALE DRAWING			SCALE — WEIGHT — SHEET



6.3 V. POWER SUPPLY
HEAT SINK
+200 V. POWER SUPPLY
-105V POWER SUPPLY
+20 V.D.C. POWER SUPPLY
MU METAL CAN
COMMON
+28V
-28V
+20V
+200V
6.3 V.A.C. REG.
-105 V.D.C.
-1610 V
-650 V.
T701
T702
J701
P701
J702
P702
J802
P802
J801
P801
J901
P901
T771
T801
T802
T901
B701
FAN
V701
OB2
Q701 2N336
Q702 2N119
Q703 2N213
Q704 2N1218
Q705 2N1218
Q707 2N2152A
Q708 2N2152A
Q751 2N1136B
Q801 2N173
Q802 2N173
Q805 2N1099
Q807 2N1099
V901 6080
V902 6080
CR701 1N1692
CR703 1N1692
CR705 1N751
CR751 1N2484/F6
CR752 1N2484/F6
CR753 10M70Z82
CR754 10M70Z82
CR755 1N1367
CR771 1N3209
CR772 1N3209
CR822 1N3209
CR823 1N3209
1N3209 (4)
1N2484 (4)
CR801 1N2970
CR802 1N2977B
CR805 1N609
C771 4000 50 VDC
C772 4000 50 VDC
C773 0.25 200 VDC
C821 2000 25VDC
C822 9000 50VDC
C823 0.25 200 VDC
C901 150 450VDC
C902 .05
C904 .02 600VDC
R714 5 25W
R760 100Ω 2W
R801 33±10%, 2W
R824 250±5% 10W
R826 1.0 25W
R919 6.8K 2W
R934 10±5% 10W
R935 220K 1W
K801 28VDC



NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTORS IN OHMS 1/2 WATT 5%
2. Q908, Q909: "IS" INDICATES INTERNAL SHIELD
3. ALL CAPACITORS IN PICOFARADS

FIGURE 2-14.
SCHEMATIC DIAGRAM, POWER SUPPLY, NM-62B
18258-E

SECTION III

ALIGNMENT AND MAINTENANCE

3.0 INTRODUCTION

The alignment and maintenance data given in this section is intended for use only by skilled personnel experienced in the use of laboratory test equipment. Alignment of the NM-62B should not be attempted unless the proper test equipment is available, and unless the instructions given in this manual are clearly understood.

3.1 DISASSEMBLY PROCEDURES

To obtain maximum shielding effectiveness, the equipment case is held in place by twenty-six No. 10 countersunk retaining screws. These screws are located along the edges of the front panel. The following procedure can be used to remove the case from the cabinet.

a) Remove the retaining screws.

b) Tilt the unit slightly forward and withdraw the equipment case.

Each RF Tuner is held in place by four No 8 and four No. 6 Phillips binder head screws. To work on a particular RF Tuner, the adjacent tuner will usually have to be removed.

3.2 ALIGNMENT OF OSCILLATOR AND PRESELECTOR CAVITIES

Although the oscillator and preselector cavities have been carefully aligned by the manufacturer, a slight amount of retuning may be necessary if a klystron is replaced. To perform these adjustments, the following test equipment is required:

1. Signal Generator, 1 - 10 KMC
2. Frequency Meter, 1 - 10 KMC
3. DC Milliammeter, capable of reading up to 15 milliamperes
4. DC Voltmeter, with a sensitivity of at least 20,000 ohms per volt, and a range extending to at least 600 volts.

Alignment procedures for the various tuners are given in the following sub-paragraphs.

3.2.1 Band 1 Tuner. - Set the Tuner dial to 1.0 KMC. The index mark located on the edge of the oscillator cam plate (see Figure 3-1) should be in exact alignment with the cursor mark. If the alignment is not exact, remove the dial housing cover by taking out the four retaining screws and snapping off the cover plate. Loosen the dial clamp screw, align the index mark with the cursor mark, and rotate the dial until it reads 1.0 KMC. Tighten the dial clamp screw, and replace the cover and screws.

Set the tuner to 1.0 KMC, and turn the power on. Using a phone plug, connect a DC milliammeter to the BAND 1 CRYSTAL CURRENT jack (see Figure 3-4). Adjust the "LO" potentiometer for maximum crystal current (see Figure 3-3). Set the Tuner to 2.35 KMC, and adjust the "HI" potentiometer for maximum crystal current. Care must be taken that the repeller voltage is not changed so far as to shift the klystron to an undesired mode of oscillation. At 1.0 KMC, the repeller voltage measured between "R" and "K" should be between 30 and 70 volts. At 2.35 KMC, this voltage should be between 235 and 325 volts.

Set the Tuner to 1.7 KMC. Disconnect the oscillator output cable from the 10 db pad, and connect the cable to the frequency meter. If a reaction type wave meter is used, it can be connected into the local oscillator output circuit and the mixer crystal current can be monitored for resonance. Set the frequency meter to 1.86 KMC. Loosen the Allen set screw that retains the oscillator plunger thrust screw (see Figure 3-2), and rotate the thrust screw manually for an indication of resonance on the frequency meter. Tighten the Allen set screw.

Set the Tuner to 1.0 KMC. Set the frequency meter to 1.16 KMC, and loosen the oscillator cam clamp screw slightly (see Figure 3-2). Rotate the slot head eccentric for an indication of resonance on the frequency meter. Tighten the oscillator cam clamp screw.

Set the Tuner to 2.35 KMC, the frequency meter to 2.51 KMC, and repeat the steps given for the 1.0 KMC adjustment (see Figure 3-2). Disconnect the frequency meter from the oscillator output cable, and reconnect the cable to the 10 db pad.

The next step is to track the preselector. Set the Tuner to 1.0 KMC. With all cables connected to the Tuner, connect the NM-62B RF input cable to a signal generator tuned to 1.0 KMC, and adjust the tuning dial for maximum output on the front panel meter. Loosen the Allen set screw (see Figure 3-2) that retains the preselector thrust screw, and rotate the thrust screw manually for a maximum reading on the front panel meter. Tighten the Allen set screw. Set the Tuner to 1.07 KMC. Loosen the slot head lock screw that clamps the eccentric opposite the cam follower bearing (see Figure 3-2).

Set the signal generator to approximately 1.07 KMC, and tune it to obtain a maximum meter reading. Using the special tool provided, rotate the

eccentric for a maximum meter indication. Tighten the lock screw, taking care not to disturb the eccentric. Use the same procedure at the following frequencies:

1.15 KMC	1.76 KMC
1.25 KMC	1.88 KMC
1.34 KMC	2.03 KMC
1.44 KMC	2.16 KMC
1.54 KMC	2.31 KMC
1.65 KMC	2.35 KMC

After adjusting each eccentric, the previous eccentric setting must be checked and readjusted if necessary. This completes the alignment of the RF portion of the Tuner.

3.2.2 Band 2 Tuner. - Set the Tuner dial to 2.3 KMC. The index mark located on the edge of the oscillator cam plate (see Figure 3-1) should be in exact alignment with the cursor mark. If the alignment is not exact, remove the dial housing cover by taking out the four retaining screws and snapping off the cover plate. Loosen the dial clamp screw, align the index mark with the cursor mark, and rotate the dial until it reads 2.3 KMC. Tighten the dial clamp screw, and replace the cover and screws.

Set the Tuner to 2.3 KMC, and turn the power on. Using a phone plug, connect a DC milliammeter to the BAND 2 CRYSTAL CURRENT jack (see Figure 3-4). Adjust the "LO" potentiometer for maximum crystal current (see Figure 3-3). Set the Tuner to 4.4 KMC, and adjust the "HI" potentiometer for maximum crystal current. Care must be taken that the repeller voltage is not changed so far as to shift the klystron to an undesired mode of oscillation. At 2.3 KMC, the repeller voltage measured between "R" and "K" should be between 30 and 60 volts. At 4.4 KMC, this voltage should be between 260 and 320 volts.

Set the Tuner to 3.3 KMC. Disconnect the oscillator output cable from the crystal mixer, and connect the cable to the frequency meter. If a reaction type wavemeter is used, it can be connected into the local oscillator output circuit and the mixer crystal current can be monitored for resonance. Set the frequency meter to 3.14 KMC. Loosen the Allen set screw that retains the oscillator plunger thrust screw (see Figure 3-2), and rotate the thrust screw manually until the oscillator frequency is exactly 3.14 KMC. Tighten the set screw.

Set the Tuner to 2.3 KMC. Set the frequency meter to 2.14 KMC, and loosen the oscillator cam clamp screw slightly (see Figure 3-2). Rotate the slot head eccentric until the oscillator frequency is exactly 2.14 KMC, and then tighten the clamp screw. Set the Tuner to 4.4 KMC and the frequency meter to 4.24 KMC, and repeat the steps given for the 2.3 KMC adjustment (see Figure 3-5).

Disconnect the frequency meter from the oscillator output cable and reconnect the cable to the crystal mixer.

The next step is to track the preselector. Set the Tuner to 4.4 KMC. With all cables connected to the Tuner, connect the NM-62B RF input cable to a signal generator and adjust the frequency of the signal generator for maximum output on the front panel meter. Loosen the Allen set screw that retains the preselector thrust screw (see Figure 3-2), and rotate the thrust screw manually until a maximum reading is observed on the front panel meter. Tighten the set screw.

Set the Tuner to 4.34 KMC. Loosen the slot head lock screw that clamps the eccentric opposite the cam follower bearing (see Figure 3-2). Set the signal generator to approximately 4.34 KMC and tune it for a mzximum meter indication. Using the special tool provided, rotate the eccentric for a maximum meter reading. Tighten the lock screw, taking care not to disturb the eccentric. Use the same procedure at the following frequencies:

4.20 KMC	3.11 KMC
4.05 KMC	2.98 KMC
3.91 KMC	2.86 KMC
3.78 KMC	2.73 KMC
3.64 KMC	2.61 KMC
3.51 KMC	2.48 KMC
3.37 KMC	2.36 KMC
3.24 KMC	2.30 KMC

After adjusting each eccentric, the previous eccentric setting must be checked and re-adjusted if necessary. This completes the alignment of the RF portion of the Tuner.

3.2.3 Band 3 Tuner. - Set the Tuner dial to 4.35 KMC. The index mark located on the edge of the oscillator cam plate (see Figure 3-1) should be in exact alignment with the cursor mark. If the alignment is not exact, remove the dial housing cover by taking out the four retaining screws and snapping off the cover plate. Loosen the dial clamp screw, align the index mark with the cursor mark, and rotate the dial until it reads 4.35 KMC. Tighten the dial clamp screw and replace the cover and screws.

Set the Tuner to 4.35 KMC, and turn the power on. Using a phone plug, connect a DC milliammeter to the BAND 3 CRYSTAL CURRENT jack (see Figure 3-4). Adjust the "LO" potentiometer for maximum crystal current (see Figure3-3). Set the Tuner to 7.3 KMC, and adjust the "HI" potentiometer for maximum crystal current. Care must be taken that the repeller voltage is not changed

so far as to shift the klystron to an undesired mode of oscillation. At 4.35 KMC, the repeller voltage measured between "R" and "K" should be between 80 and 160 volts. At 7.3 KMC, this voltage should be between 390 and 530 volts.

Set the Tuner dial to 6.25 KMC, and loosen the Allen set screw that retains the preselector thrust screw (see Figure 3-5). Set the Tuner dial to 5.6 KMC, and, using a frequency meter, tune a signal generator to exactly 5.6 KMC. Connect the signal generator to the NM-62B RF input cable, and set the signal generator output to maximum. Loosen the oscillator thrust screw lock nut (see Figure 3-5), and rotate the thrust screw until a maximum meter reading is obtained. (It may be necessary to reduce the signal generator output during this operation.) Tighten the oscillator thrust screw lock nut. Adjust the preselector thrust screw for maximum meter indication.

It is now necessary to make certain that the oscillator thrust screw has not been adjusted to a point which sets the local oscillator frequency on the wrong side of the RF signal. To check for this, tune the signal generator to 5.92 KMC. Set the signal generator output to maximum, and tune for a response on the NM-62B panel meter. If a response is obtained at 5.92 KMC, the local oscillator frequency has been set above the incoming signal, as required. If the response is found instead at 5.28 KMC, the local oscillator has been below the incoming signal, and must be re-adjusted. To adjust the oscillator, set the tuning dial to 5.6 KMC and, using the frequency meter, set the signal generator to exactly 5.6 KMC. Connect the signal generator to the NM-62B RF input cable, and rotate the oscillator thrust screw to increase the local oscillator frequency; then, repeat the previous adjustments (the correct direction of rotation increases the length of the thrust screw). When the local oscillator frequency has been established as being above that of the incoming signal, tighten the local oscillator thrust screw lock nut.

Set the Tuner and the signal generator to 4.9 KMC. Using a 1/8 inch open end wrench, adjust the intermediate lower frequency oscillator cam adjustment (see Figure 3-5) for maximum meter indication. If necessary, adjust the preselector thrust screw to maintain a convenient meter indication.

Set the Tuner and signal generator to 4.35 KMC. Loosen the oscillator cam clamp screw slightly, and rotate the slot head eccentric for a maximum meter reading. Tighten the oscillator cam clamp screw.

Set the Tuner and signal generator to 6.5 KMC, and adjust the intermediate upper frequency oscillator cam adjustment (see Figure 3-5) for a maximum meter reading.

Set the Tuner and signal generator to 7.3 KMC. Loosen the oscillator cam clamp screw slightly, and rotate the slot head eccentric for a maximum meter reading. Tighten the oscillator cam clamp screw.

The next step is to adjust the preselector. Connect the signal generator to the NM-62B RF input cable. Set the Tuner and signal generator to 7.3 KMC, and tune the signal generator to peak the reading on the NM-62B front panel meter. Adjust the preselector thrust screw for a maximum meter indication. Tighten the Allen set screw that retains the preselector thrust screw.

Set the Tuner and signal generator to 7.125 KMC, and tune the signal generator to peak the reading on the NM-62B front panel meter. Loosen the slot head screw that clamps the eccentric opposite the cam follower bearing (see Figure 3-5) and, using the special tool provided, rotate the eccentric for maximum meter indication. Tighten the lock screw, taking care not to disturb the eccentric. Use the same procedure at the following frequencies:

6.9 KMC	5.3 KMC
6.675 KMC	5.125 KMC
6.475 KMC	4.95 KMC
6.25 KMC	4.775 KMC
6.05 KMC	4.6 KMC
5.875 KMC	4.45 KMC
5.675 KMC	4.35 KMC
5.5 KMC	

After adjusting each eccentric, the previous eccentric setting must be checked and readjusted if necessary. This completes the alignment of the RF portion of the Tuner.

3.2.4 Band 4 Tuner. - Set the Tuner dial to 7.25 KMC. The index mark located on the edge of the oscillator cam plate (see Figure 3-1) should be in exact alignment with the cursor mark provided. If the alignment is not exact, remove the dial housing cover by taking out the four retaining screws and snapping off the cover plate. Loosen the dial clamp screw, align the index mark with the cursor mark, and rotate the dial until it reads 7.25 KMC. Tighten the cial clamp screw, and replace the cover and screws.

Set the Tuner to 7.25 KMC, and turn the power on. Using a phone plug, connect a milliammeter to the BAND 4 CRYSTAL CURRENT jack (see Figure 3-4). Adjust the "LO" potentiometer for maximum crystal current (see Figure 3-3). Set the Tuner to 10.05 KMC, and adjust the "HI" potentiometer for maximum crystal current. Care must be taken that the repeller voltage is not changed so far as to shift the klystron to an undesired mode of oscillation. At 7.25 KMC, the repeller voltage measured between "R" and "K" should be between 65 and 100 volts. At 10.05 KMC, this voltage should be between 190 and 230 volts.

Set the tuner dial to 8.75 KMC, and loosen the Allen set screws which retain the preselector thrust screw and the oscillator plunger thrust screw (see Figure 3-6). Using a wavemeter, tune the signal generator to exactly 8.75 KMC. Connect the signal generator to the NM-62B RF input cable, and set the signal generator output to maximum. Rotate the oscillator thrust screw for a maximum meter indication (it may be necessary to reduce the signal generator output during this operation). Tighten the set screw that retains the oscillator thrust screw. Adjust the preselector thrust screw for a maximum meter indication.

It is now necessary to make certain that the oscillator thrust screw has not been adjusted to a point which sets the local oscillator frequency on the wrong side of the RF signal. To check for this, tune the signal generator to 8.43 KMC. Set the signal generator output to maximum, and tune for a response on the NM-62B panel meter. If a response is obtained at 8.43 KMC, the local oscillator frequency has been set below the incoming signal, as required. If the response is found instead at 9.07 KMC, the local oscillator has been set above the RF signal and must be readjusted. To adjust the oscillator, set the tuning dial to 8.75 KMC, and using a frequency meter, set the signal generator to exactly 8.75 KMC. Connect the signal generator to the NM-62B input cable, and rotate the oscillator thrust screw to decrease the local oscillator frequency; then repeat the previous adjustments (the correct direction of rotation decreases the thrust screw length). When the local oscillator frequency has been established as being below that of the RF signal, tighten the local oscillator thrust screw.

Set the Tuner to 7.95 KMC and, using a frequency meter, tune the signal generator to 7.95 KMC. Using a 1/8-inch open end wrench, adjust the intermediate lower frequency oscillator cam adjustment (see Figure 3-6) for a maximum meter indication. If necessary, adjust the preselector thrust screw to maintain a good meter indication.

Set the Tuner and signal generator to 7.25 KMC. Loosen the oscillator cam clamp screw slightly, and rotate the slot head eccentric for a maximum meter reading. Tighten the oscillator cam clamp screw.

Set the Tuner and signal generator to 9.75 KMC, and adjust the intermediate upper frequency oscillator cam adjustment (see Figure 3-6) for a maximum meter indication.

Set the Tuner and signal generator to 10.05 KMC. Loosen the oscillator cam clamp screw slightly, and rotate the slot head eccentric for a maximum meter indication. Tighten the oscillator cam clamp screw.

The next step is to adjust the preselector. Connect the signal generator to the NM-62B RF input cable. Set the Tuner and the signal generator to 7.25 KMC, and tune the signal generator to peak the reading on the NM-62B front

panel meter. Adjust the preselector thrust screw for a maximum meter reading. Tighten the Allen set screw that retains the preselector thrust screw. Set the Tuner and signal generator to 7.55 KMC, and tune the signal generator to peak the reading on the front panel meter. Loosen the slot head lock screw that clamps the eccentric opposite the cam follower bearing (see Figure 3-6) and, using the special tool provided, rotate the eccentric for maximum meter indication. Tighten the lock screw, taking care not to disturb the eccentric. Use the same procedure at the following frequencies:

7.775 KMC	9.15 KMC
8.0 KMC	9.375 KMC
8.225 KMC	9.6 KMC
8.45 KMC	9.85 KMC
8.675 KMC	10.05 KMC
8.9 KMC	

After adjusting each eccentric, the previous eccentric setting must be checked and readjusted if necessary. This completes the alignment of the RF portion of the Tuner.

3.3 PREAMPLIFIER ALIGNMENT

The alignment of the 160 Mc preamplifiers is divided into two phases. The first phase is preliminary and consists of peaking the three tuning adjustments of the preamplifier (see Figure 3-7) with a CW signal generator connected to the input of the appropriate RF Tuner.

The final alignment of the preamplifiers is done after the meter scale has been tracked, since the setting of the preamplifier output transformer affects the 20 db IF attenuator.

3.3.1 Preliminary Alignment. - Tune a signal generator to approximately the center of the frequency range of the Band 1 Tuner. Connect the RF input cable to the generator, select BAND 1, and peak the signal on the output meter. Tune T102, T103, and T104 for a maximum reading on the output meter (see Figure 3-7). Use this procedure on the Band 2, 3, and 4 preamplifiers. This completes the preliminary alignment. After the meter scale tracking has been completed (see paragraph 3.11) the final alignment must be done.

3.3.2 Final Alignment. - Tune a signal generator to the center of the Band 4 tuning range. Set the ATTENUATOR to X10. Using the CAL control, set the output meter to 0 db. Connect the generator to the Band 4 Tuner and carefully tune the NM-62B for a maximum meter indication (turn the AFC on, if necessary to maintain a stable meter indication). Adjust the signal generator output to give

a full scale meter indication. Set the ATTENUATOR to X10^2. Adjust the potentiometer of the 20 db IF attenuator (see Figure 3-8), located at the rear of the coaxial switch, to give a meter reading of 20 db. Tune T404 for a maximum meter indication. Switch the ATTENUATOR to X10. If necessary, adjust the signal generator output for a 40 db reading on the meter. Switch the ATTENUATOR to X10^2. If necessary, adjust the potentiometer of the 20 db IF attenuator to give a 20 db reading. Repeat these steps until the meter indicates a change of exactly 20 db when the ATTENUATOR is switched between X10 and X10^2.

The following procedures apply to the Bands 1, 2, and 3 preamplifiers, but a detailed description will be given for Band 1 only. Tune a signal generator to approximately the center of the Band 1 tuning range. Set the ATTENUATOR to X10. Using the CAL control, set the output meter to 0 db. Connect the generator to the Band 1 Tuner, and carefully tune the NM-62B for a maximum meter indication (use AFC, if necessary). Adjust the signal generator output to give a 40 db reading on the meter. Switch the ATTENUATOR to X10^2 and adjust T104 for a meter reading of 20 db. Switch the ATTENUATOR to X10 and adjust the signal generator output for a meter reading of 40 db. Switch the ATTENUATOR to X10^2 and adjust T104 for a meter reading of 20 db. Repeat these steps until the meter indicates a change of exactly 20 db when the ATTENUATOR is switched between X10 and X10^2.

3.4 ALIGNMENT OF MAIN IF AMPLIFIER

Connect a Hewlett-Packard 608C signal generator, or equivalent, to the input receptacle of S1509 (the coaxial switch located at the input of the main IF amplifier). Tune the signal generator to 60 Mcs. Set the METER FUNCTION switch to QUASI-PEAK, and the QUASI-PEAK switch to 0.05/600. Peak L1006, T1001, C1053, T1002, C1054, T1003, C1005, C1056, and T1004 (see Figure 3-9).

Set the BANDWIDTH switch to 0.05 Mc, and peak L1004 and L1005. Return the BANDWIDTH switch to 5 Mc. Tune the signal generator to 63.5 Mc, and peak L1002. Change the signal generator frequency to 56 Mc, and peak L1003. Connect a sweep generator to the input, and tune it to 60 Mc with a sweep width of 15 Mc. Connect an oscilloscope to the STRETCHED VIDEO receptacle on the front panel, and set the VIDEO STRETCH switch to 30 microseconds.

Adjust the output level of the sweep generator so that no limiting action is observed on the oscilloscope. Set the METER FUNCTION switch to SLIDEBACK PEAK, and turn the PEAK control fully counter-clockwise. Adjust T1005 and C1057 alternately until the waveform displayed on the oscilloscope has a symmetrical waveform with a rounded top (refer to Figure 3-10). Using a CW signal generator, check the 6 db bandwidth. This should be 5 Mc at the half voltage points. If the bandwidth is too wide, adjust L1002 and L1003 until a correct bandpass characteristic is observed. If necessary, readjust T1005 and C1057 to obtain a symmetrical bandpass.

3.5 AFC ALIGNMENT

Using the same test equipment as in Paragraph 3.4, reconnect the signal generator to the main IF input receptacle. Set the RECEIVE switch to FM, and connect a DC VTVM to the FM output receptacle. Tune the signal generator to 64 Mc, and set the output level to 100 microvolts. Peak L602 (see Figure 3-11). Change the signal generator frequency to 63 Mc, and peak L603. Tune the signal generator to 56 Mc, and peak L604 and L606. When peaking the coils, the DC output will be positive at 63 and 64 Mc, and negative at 56 Mc.

Reconnect the sweep generator to the main IF input receptacle, and connect an oscilloscope to the FM output receptacle. The discriminator output should be displayed on the oscilloscope as an "S" curve (refer to Figure 3-12). As shown, the center portion of the "S" curve should be reasonably linear from 57.5 to 62.5 Mc. Minor adjustments may be made to L603 and L606 to set this range. Adjust L601 and L605 to achieve maximum output and to bring the 60 Mc marker to the base line. Disconnect the sweep generator from the IF input. Connect the DC VTVM to the FM output. Adjust L601 for zero volts on the VTVM.

3.6 FIRST IF AND CONVERTER ALIGNMENT

Connect the Hewlett-Packard 608C signal generator to the input cable of the 1st IF and converter chassis (refer to Figure 3-8). Set the METER FUNCTION switch to QUASI-PEAK, and the QUASI-PEAK switch to 0.05/600. Tune the signal generator to 160 Mc, and peak L505 (see Figure 3-13). When the peak has been reached, turn L505 clockwise enough to decrease the front panel meter reading about 1/2 db. Then, adjust L501, L503, and L504 to peak the meter reading. Change the signal generator frequency to 133.3 Mc and adjust L518 for a minimum meter indication. With the signal generator at 160 Mc, adjust L519 for a maximum meter indication.

3.7 NARROWBAND GAIN ADJUSTMENT

Refer to Figures 3-4 and 3-9. Using the same test configuration as Paragraph 3.6, set the BANDWIDTH switch to 5 Mc and note the meter reading. Then, rotate the BANDWIDTH switch to 0.5 Mc. Repeak L1004 and L1005 on the main IF amplifier, and then set the NARROW BW GAIN adjustment (see Figure 3-4) to the meter reading previously noted. If more than a 1 db difference between the two indications is noted, L1004 and L1005 must be repeaked. Repeat these steps until the gain is equal for both bandwidths.

3.8 DISCRIMINATOR ZERO ADJUSTMENT

Using the same test configuration as outlined in Paragraph 3.6, connect a high impedance DC VTVM to the common slider connector of CHOPPER BAL 1, R1164, and CHOPPER BAL 2, R1163 (see Figure 3-14). Set the RECEIVE switch to FM and check to see if the VTVM reading is zero. If not, L603, and

L606 on the AFC chassis (see Figure 3-11) should be adjusted slightly to bring the VTVM reading to zero. Switch the RECEIVE switch to AM, and adjust the DISCRIM ZERO potentiometer (see Figure 3-4) to zero the VTVM.

3.9 CALIBRATOR VOLTAGE BALANCE

To adjust the CAL VOLT BAL, connect the high impedance VTVM to the feed through capacitor on the impulse calibrator. Press the CAL button. The VTVM should show a polarity reversal at approximately one second intervals. Adjust the CAL VOLT BAL (see Figure 3-4) to make the positive and negative voltages equal in amplitude.

3.10 DYNAMIC RANGE ADJUSTMENTS

Set a CW signal generator to 60 Mc, and connect its output to P1502 (see Figure 3-16). Set the METER FUNCTION switch to FIELD INTENSITY. Adjust the signal generator for a full scale reading on the front panel meter of the NM-62B. Disconnect the white/black lead from feed-thru capacitor C1004, on the side of the main IF amplifier (see Figure 3-16). Connect a variable external DC voltage source to C1004, and adjust the voltage to bring the front panel meter reading to full scale. Connect a high impedance DC VTVM to the white/black lead previously disconnected from C1004. Note the DC voltage reading. Increase the output of the signal generator by 20 db. Adjust the DYNAMIC RANGE control (see Figure 3-4) to increase the VTVM reading to nine times the reading that caused the front panel meter to read full scale. The dynamic range is now set. Reconnect the lead to capacitor C1004.

3.11 METER SCALE TRACKING ADJUSTMENTS

For convenience use the remote meter, noting any slight differences that may occur between the remote meter and front panel meter readings. Always use the front panel meter as the standard. The meter scale tracking must first be performed in the FIELD INTENSITY function.

Connect an appropriate signal generator to the RF input of the NM-62B, and set the front panel controls as follows:

AFC	- OFF
BANDWIDTH	- 5 Mc
METER RESPONSE	- FAST
ATTENUATOR	- $X10^2$

3.11.1 Meter Zero. - Set the METER FUNCTION switch to METER ZERO. Adjust the meter zero potentiometer, located beside the meter, to zero the meter.

3.11.2 Field Intensity. - Rotate the METER FUNCTION switch to FIELD INTENSITY.. Set the signal generator to provide a CW output of one millivolt. Tune the NM-62B to the signal generator frequency. Throughout the meter scale tracking procedures, make certain that the NM-62B is tuned exactly to the signal generator frequency.

Adjust the CAL control to bring the meter reading to midscale (20 db). Increase the signal generator output by 20 db. Adjust the FI-100 potentiometer (see Figure 3-4) to bring the meter reading to the top of the scale (40 db). Decrease the signal generator output by 20 db (to 1 millivolt). Adjust the CAL control to bring the meter to mid-scale (20 db). Repeat these steps until the meter reads correctly at both mid-scale (20 db) and at the top of the scale (40 db).

Set the signal generator output to 100 microvolts, and adjust the FI-1 potentiometer (see Figure 3-4) to bring the meter reading to the bottom of the scale (0 db). Increase the signal generator output by 20 db, and adjust the CAL control to bring the meter reading to mid-scale (20 db). Decrease the signal generator output by 20 db (to 100 microvolts). Adjust the FI-1 potentiometer for a 0 db reading on the meter. Repeat these steps until the meter reads correctly at both points.

Set the signal generator output to 10 millivolts, and check the full scale meter reading. Adjust the FI-100 potentiometer, if necessary.

Repeat the entire procedure until the meter reads correctly at the bottom of the scale (0 db), mid-scale (20 db), and the top of the scale (40 db).

CAUTION

If other meter functions are to be tracked, the CAL control setting must not be changed from the setting established during FIELD INTENSITY tracking.

3.11.3 Direct Peak. - Rotate the METER FUNCTION switch to the DIRECT PEAK position, and adjust the signal generator to obtain a CW output of 10 millivolts. Adjust tuning for a maximum meter indication. Adjust the DP-100 potentiometer (see Figure 3-4) for a meter reading at the top of the scale (40 db). Reduce the output of the signal generator by 40 db (to 100 microvolts). Adjust the QP-1 potentiometer (see Figure 3-4) for a reading of 0 db at the bottom of the scale. Repeat these steps until the 0 db and 40 db readings are correct.

3.11.4 Quasi-Peak. - Rotate the METER FUNCTION switch to the QUASI-PEAK position, and set the QUASI-PEAK switch to the 0.05/600 position. Set the signal generator to provide a CW output of 10 millivolts. Adjust the QP-100 potentiometer (see Figure 3-4) to obtain a full scale reading (40 db).

3.11.5 Slideback Peak. - Rotate the METER FUNCTION switch to the SLIDEBACK PEAK position. Adjust the signal generator to obtain a pulse modulated output of 10 microseconds, a PRF of 1000 CPS, and an amplitude of 10 millivolts. Adjust the PEAK control to obtain a meter reading at the top of the scale (40 db). Adjust the SP-100 potentiometer (see Figure 3-4) to make the PEAK INDICATOR lamp flash at a low rate.

Decrease the signal generator output to 100 microvolts. Adjust the PEAK control to bring the meter reading to the bottom of the scale (0 db). Adjust the SP-1 potentiometer (see Figure 3-4) to make the PEAK INDICATOR lamp flash at a low rate. Repeat these steps until the 0 db and 40 db readings are correct.

3.12 CHOPPER BAL 1 AND 2

Adjust the signal generator to provide a CW output of 1 millivolt at 2.32 KMC. Rotate the RECEIVE switch to FM, and tune in the signal on Band 1. Switch the AFC to ON. Adjust the CHOPPER BAL 1 for a maximum meter reading (see Figure 3-14). When this is properly set, the AFC may be switched off and on without changing the meter indication. Switch to Band 2, tune in the signal, and adjust the CHOPPER BAL 2 for a maximum meter reading.

3.13 POWER SUPPLY ADJUSTMENTS

Remove the eighteen screws that secure the Power Supply panel to the case and slide the unit forward to remove from the case.

NOTE

The power supply should not be operated for long periods of time with the cover removed because the heat dissipation system will not operate efficiently under these conditions.

3.13.1 20 Volt Supply. - Turn the power ON. Connect a DC voltmeter across C801, and adjust R825 for a meter reading of approximately 18 volts. Turn the power OFF.

3.13.2 6.3 Volt Supply. - To perform this adjustment, an oscilloscope and a thermal voltmeter are required. Connect the oscilloscope and the thermal voltmeter to pin 27, 29, or 34, of the power input terminal board, TB1501. Insert fuses F1506, F1507, and F1508, and turn the power ON. Observing the output on the oscilloscope, set R738 to balance both half cycles of the clipped sine wave voltage. Observing the thermal meter, adjust R737 for an output of 6.3 volts. Turn the power OFF.

3.13.3 +200 Volt Supply. - Connect a DC voltmeter to terminal 29 of TB1502 and turn the power ON. Wait until the READY lamp lights, then adjust R916 for an output of 200 volts.

3.13.4 High Voltage Supply. - Connect two high voltage DC meters to pins 12 and 50 of TB1502, respectively. Adjust R825 so that the two voltages read approximately -650 and -1610.

R826, R752, and R739 are variable resistors for setting the voltage regulation range. These are factory set and require no adjustment in the field.

3.14 CORRECTIONS TO CALIBRATION CHART (Figure 1-2) AND GAIN VARIATION CHART (Figure 1-4) AFTER REALIGNMENT

3.14.1 General. - Data has been plotted in Figures 1-2 and 1-4 in the Operator's Section for the individual equipment as shipped. Upon completion of the preceding alignment and maintenance procedures, it may be necessary to take new data and re-plot these charts. If the overall bandpass of the equipment is not altered during re-alignment, and if an accurate signal generator is used, the original data in Figure 1-2 (Calibration Chart) may closely resemble the new data. If so, re-drawing of the CALIBRATION CHART is unnecessary. The data in Figure 1-4 (Gain Variation) is subject to change during realignment. This may require re-drawing of the GAIN VARIATION CHARTS.

NOTE

The absolute value of calibration is dependent upon the accuracy of the calibrating source.

3.14.2 Procedure. - Calibration Chart (Figure 1-2) Data

1. Upon completion of alignment the RFI Meter should be installed in the equipment case and allowed to warm-up for one hour before taking new data.

2. Install the 92477-1 RF Cable, serialized to the RFI equipment under calibration, and connect to signal generator of known accuracy.

3. Adjust the signal generator for desired frequency and set the output for 1000 microvolts.

4. Place the RFI Meter controls as follows: ATTENUATOR in the $X10^2$ position. METER FUNCTION switch in the FIELD INTENSITY position. BANDWIDTH switch in the 5 Mc position. METER RESPONSE switch in the FAST position, and AFC switch in the ON position. Accurately tune the input signal for an upscale reading on the meter.

5. Adjust the CAL control for an indication of exactly 20 db on the meter.

6. Depress the CAL button and record the meter reading.

7. Repeat steps 3 through 6 for every 200 megacycle point beginning with 1. 0 Gc.

8. Check data recorded against data plotted in Figure 1-2. If necessary, re-plot Figure 1-2 and take an average calibration figure for the overall frequency range.

9. Enter this average calibration figure on the 93131-2 NM-62B slide rule calculator.

3. 14. 3 Procedure. - Gain Variation (Figure 1-4)

1. The lowest frequency indication of each of the four RF Tuners should be taken as the zero db or reference for the gain variation of the individual tuners. The lowest frequency indication of the Band 1 Tuner is used as the reference for the gain variation of the complete range.

2. At the lowest indicated frequency for the Tuner under calibration, repeat procedure under 3. 14. 2 beginning with step 3 and ending with step 5.

3. Lock the CAL control upon completion of step 5 above.

4. Repeat steps 3 and 4 (from 3. 14. 2) for each 200 megacycle point above the lowest frequency of the Tuner. Record the difference indication, in db above (+) or below (-) the referenced 20 db point.

5. Repeat 2 through 4 above for each of the RF Tuners.

6. Re-plot the recorded data on Figure 1-4.

3.15 SECTOR SCAN CALIBRATION PROCEDURE

The sector scan function should be calibrated as described in the following sub-paragraphs.

3.15.1 Preliminary Adjustments. - Set the BAND SWITCH to the FULL RANGE position and adjust the frequency of all four RF Tuners to the low end (Band 1). Connect a floating digital voltmeter, Hewlett-Packard Model 3440A, or equivalent, to terminal 44 of TB1502. Adjust the Bands 1 through 4 digital limit potentiometers as follows:

a) Adjust the Band 1 frequency to exactly 1.0 Gc and adjust potentiometer R121 to obtain 1.0 volt on the digital voltmeter.

b) Adjust the Band 1 frequency to exactly 2.3 Gc and adjust potentiometer R120 to obtain 2.3 volts on the digital voltmeter.

c) Repeat steps "a" and "b" as necessary to obtain proper tracking of the voltage at terminal 44 of TB1502 with the indication on the frequency dial.

d) With the Band 1 Tuner at the high end (2.3 Gc), adjust the Band 2 frequency to exactly 2.3 Gc and adjust potentiometer R220 to obtain 2.3 volts on the digital voltmeter.

e) Adjust the Band 2 frequency to exactly 4.4 Gc and adjust potentiometer R219 to obtain 4.4 volts on the digital voltmeter.

f) Repeat steps "d" and "e" as necessary to obtain proper tracking of the voltage at terminal 44 of TB1502 with the indication on the frequency dial.

g) With the Band 2 Tuner at the high end (4.4 Gc), adjust the Band 3 frequency to exactly 4.4 Gc and adjust potentiometer R331 to obtain 4.4 volts on the digital voltmeter.

h) Adjust the Band 3 frequency to exactly 7.3 Gc and adjust potentiometer R330 to obtain 7.3 volts on the digital voltmeter.

i) Repeat steps "g" and "h" as necessary to obtain proper tracking of the voltage at terminal 44 of TB1502 with the indication on the frequency dial.

j) With the Band 3 Tuner at the high end (7.3 Gc), adjust the Band 4 frequency to exactly 7.3 Gc and adjust potentiometer R432 to obtain 7.3 volts on the digital voltmeter.

k) Adjust the Band 4 frequency to exactly 10 Gc and adjust potentiometer R430 to obtain 10 volts on the digital voltmeter.

l) Repeat steps "J" and "K" as necessary, to obtain proper tracking of the voltage at terminal 44 of TB1502 with the indication on the frequency dial.

3.15.2 <u>SFI Potentiometer Adjustment</u> - Set the BAND SWITCH to the FULL RANGE position and the SECTOR WIDTH control to "zero". Adjust the SFI potentiometer as follows:

a) Adjust potentiometers R1719 and R1721, located on the scan chassis, to their mid-range positions.

b) Set the SFI potentiometer, R1570, for equal sector widths at top and bottom of Band 3.

3.15.3 <u>Final Adjustments</u> - Set the BAND SWITCH to the FULL RANGE position, the TUNING MODE switch to SECTOR SCAN, and the SCAN RATE to OFF. Perform the adjustments as follows:

a) Adjust the SECTOR CENTER FREQUENCY control to 5.5 and the SECTOR WIDTH to 0.

b) Remove the scan chassis from the RFI unit.

c) Remove the cover and sub-chassis from the scan chassis, leaving all connectors in place.

d) Set the SCAN RATE to ON and observe the upper and lower switching points on the Band 3 frequency dial: Adjust R1719 and R1721 so that switching takes place over a range of 200 Mc.

e) Track R1719 and R1721 as close to 5.4 and 5.6 GC as possible.

f) The 200 Mc sector should now be centered with $\pm$100 Mc of 5.5 Gc. Now adjust the SECTOR CENTER FREQUENCY control until switching occurs at 5.40 and 5.60 Gc.

g) Set SECTOR WIDTH to 10 and BAND SWITCH to full range. Let unit scan from 1 to 10 Gc. If unit won't cover full range of all four bands, adjust R1531 until the NM-62B scans from 1 Gc to 10 Gc with SECTOR CENTER set to 5.5.

h) Use an Allen wrench to remove the counter dial from the SECTOR CENTER FREQUENCY control, being careful not to turn the shaft: Rotate the counter dial to 5.5 and replace on the shaft; lock the Allen screw.

i) Following the above procedure, set the SECTOR WIDTH to 0.30 with the control rotated fully counter-clockwise.

3.16 DC VIDEO ADJUSTMENT

Adjust the DC VIDEO output level as follows:

a) Set the ATTENUATOR to the $X10^2$ position.

b) Set the METER FUNCTION switch to the SLIDEBACK PEAK position.

c) Adjust the PEAK control for "zero" on the meter.

d) Adjust R1315 for "zero" volts at the DC VIDEO receptacle on a VTVM.

3.17 Temperature control setting of the fan in metering unit is controlled by R1537. With R1537 full CW, the fan will be off at 75°C. Once the unit is warm, the fan speed is controlled by thermistor RT1501.

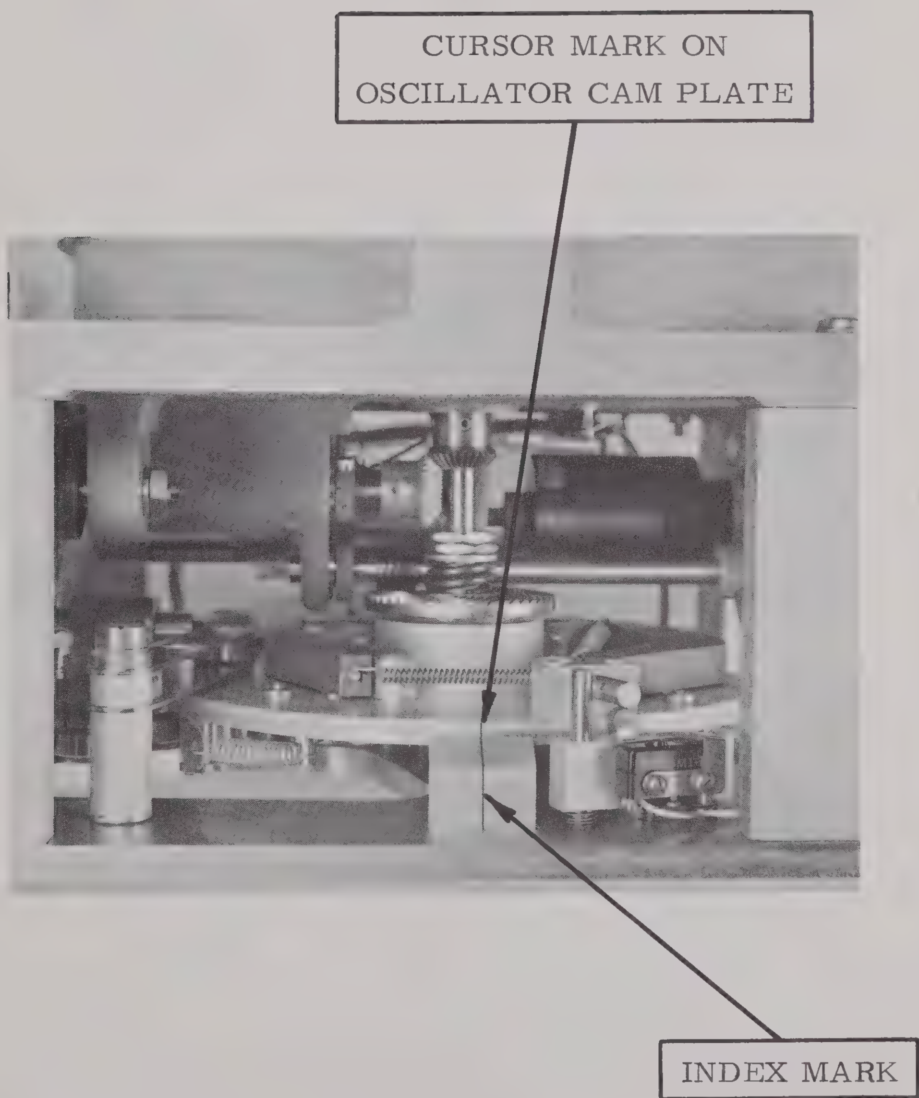


FIGURE 3-1, OSCILLATOR CAM PLATE INDEX MARK

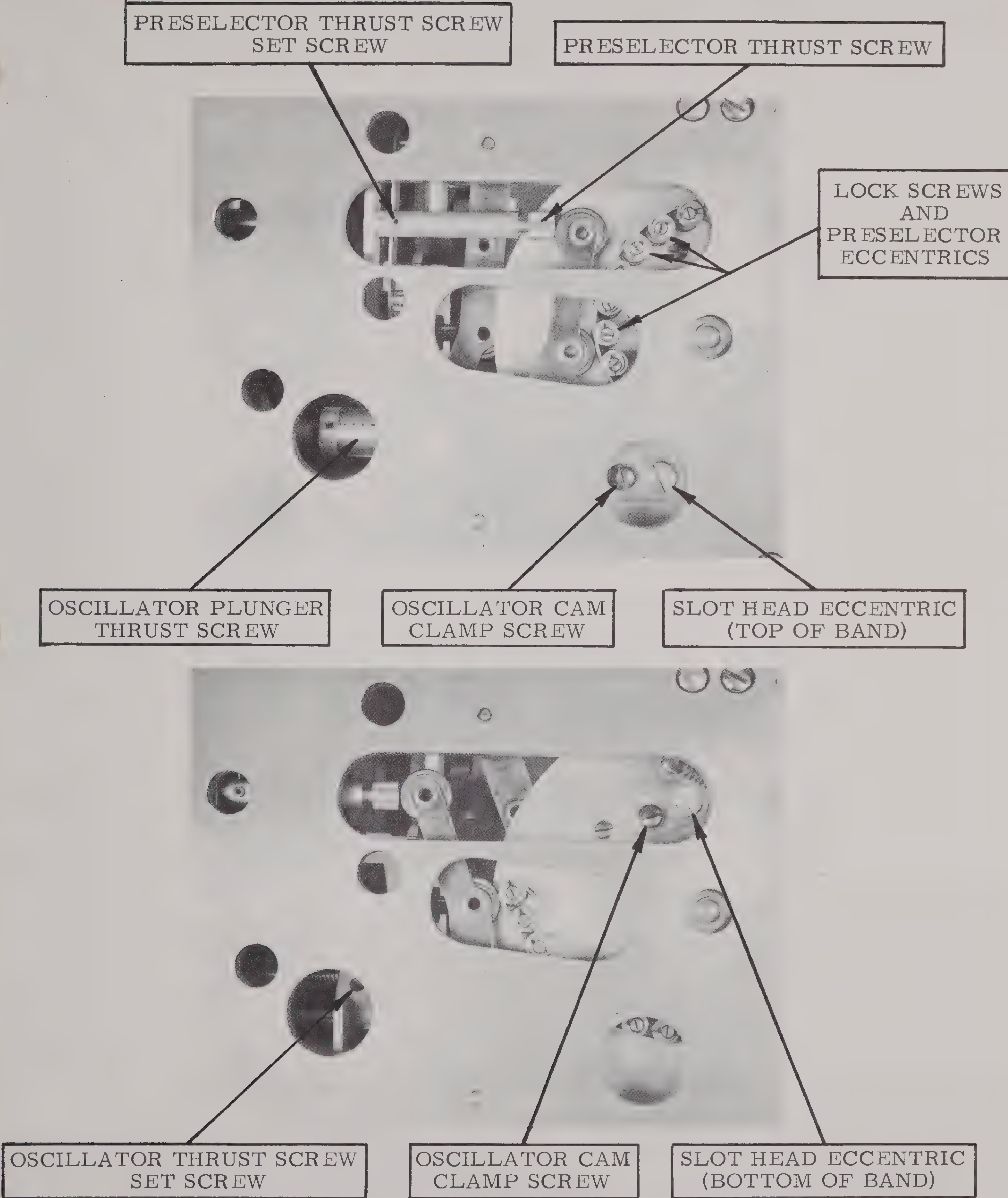


FIGURE 3-2, BANDS 1 AND 2 OSCILLATOR AND PRESELECTOR ADJUSTMENTS

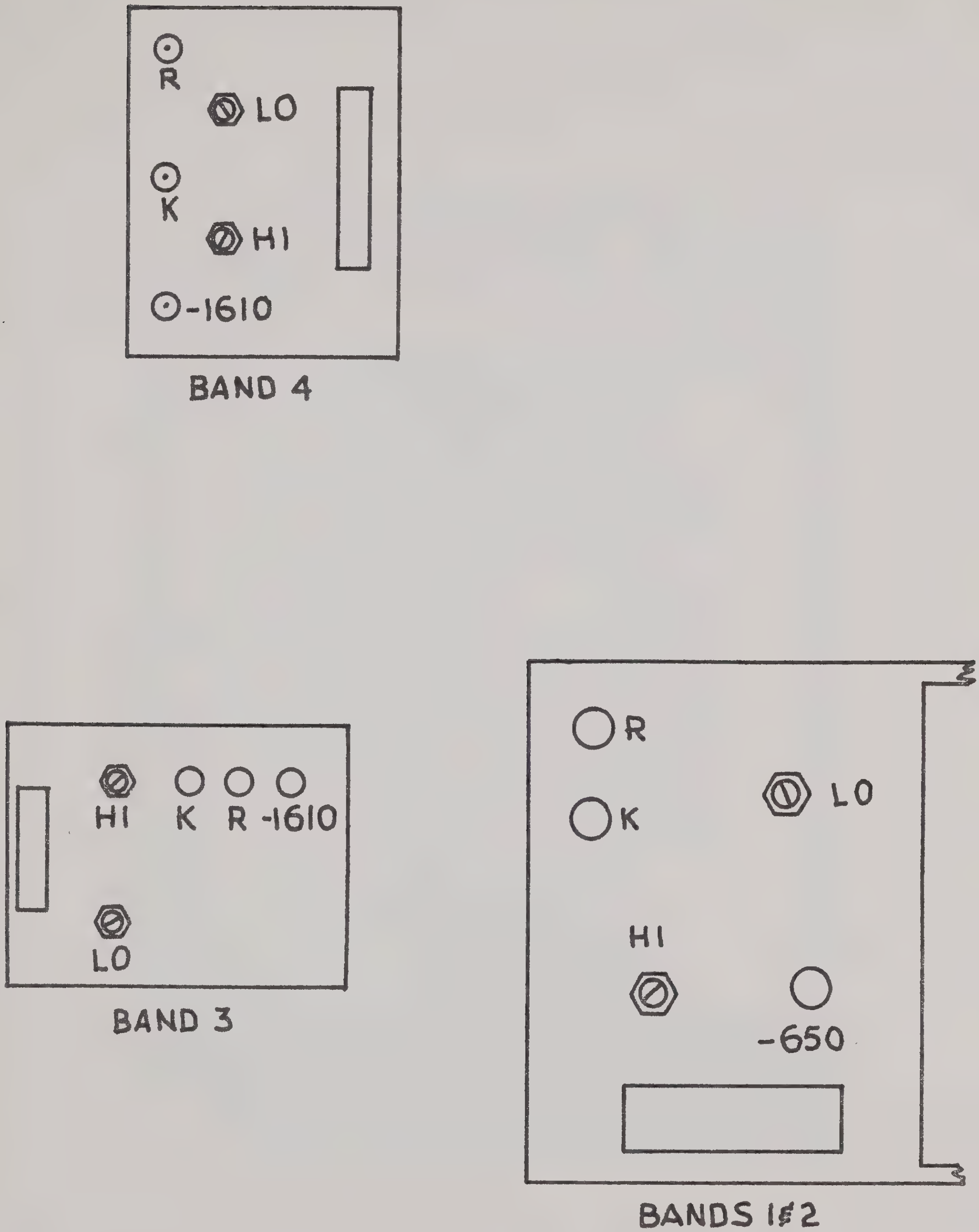


FIGURE 3-3
REPELLER VOLTAGE ADJUSTMENTS

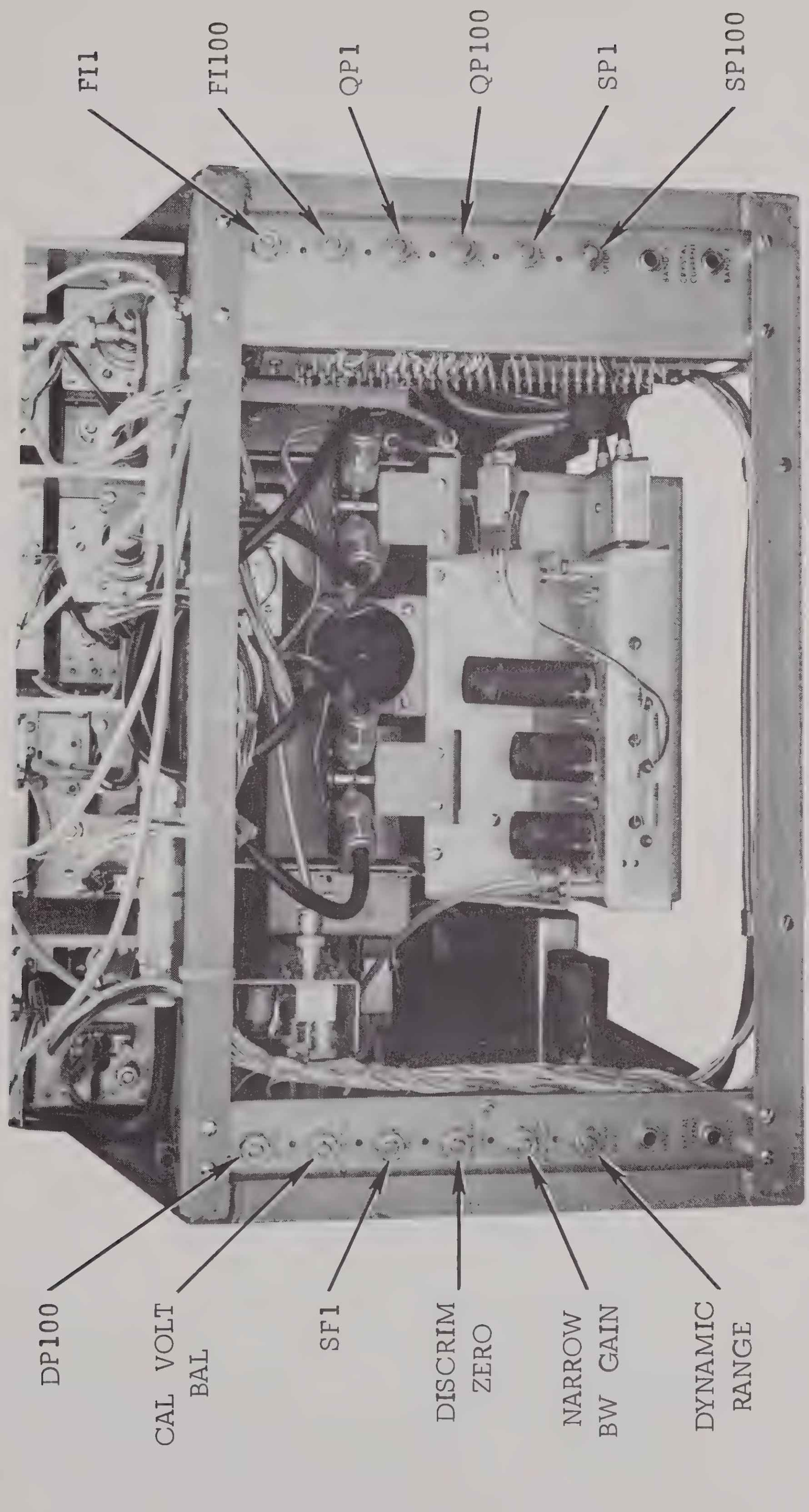


FIGURE 3-4. BACK PANEL ADJUSTMENTS

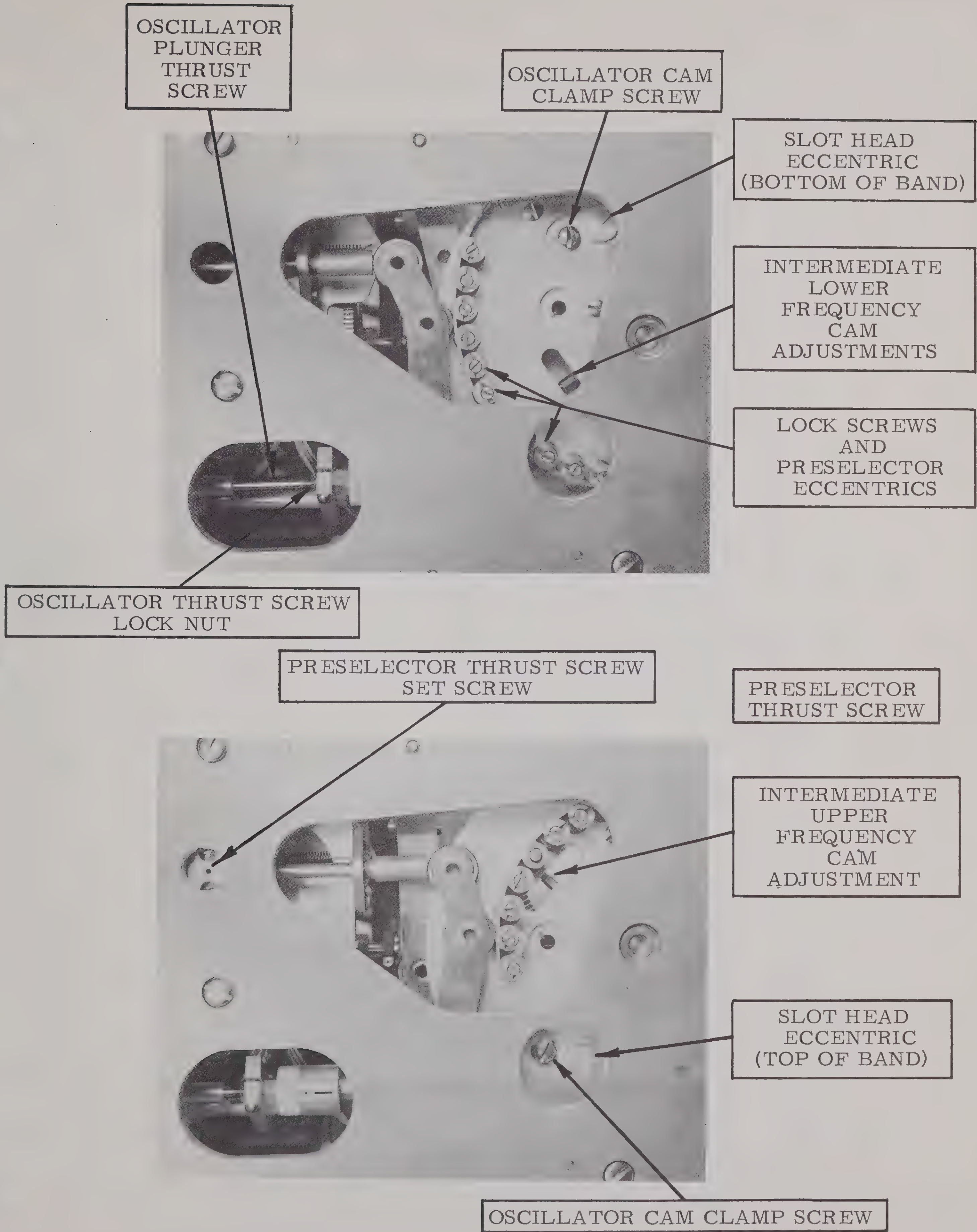


FIGURE 3-5, BAND 3 OSCILLATOR AND PRESELECTOR ADJUSTMENT

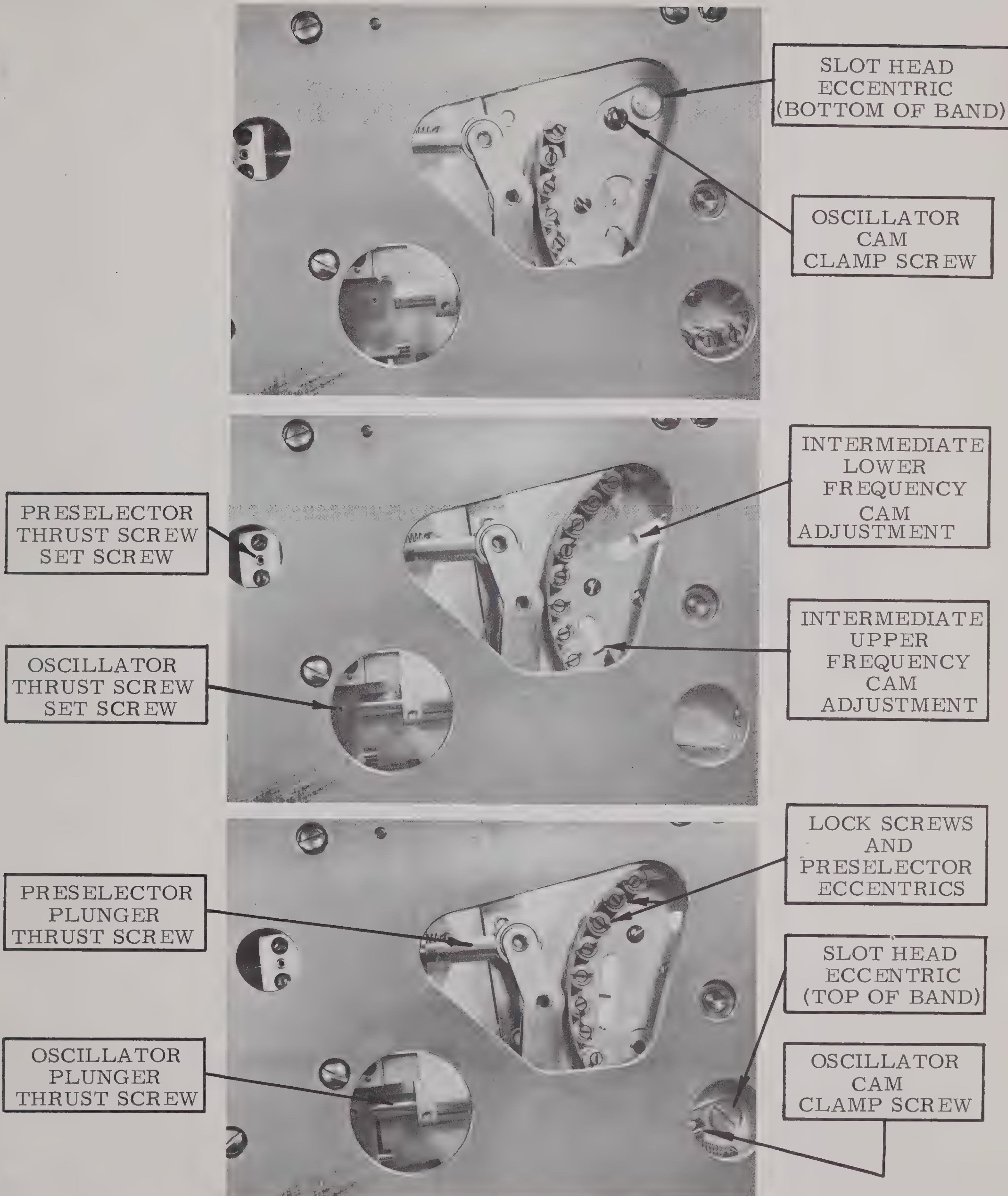


FIGURE 3-6, BAND 4 OSCILLATOR AND PRESELECTOR ADJUSTMENTS

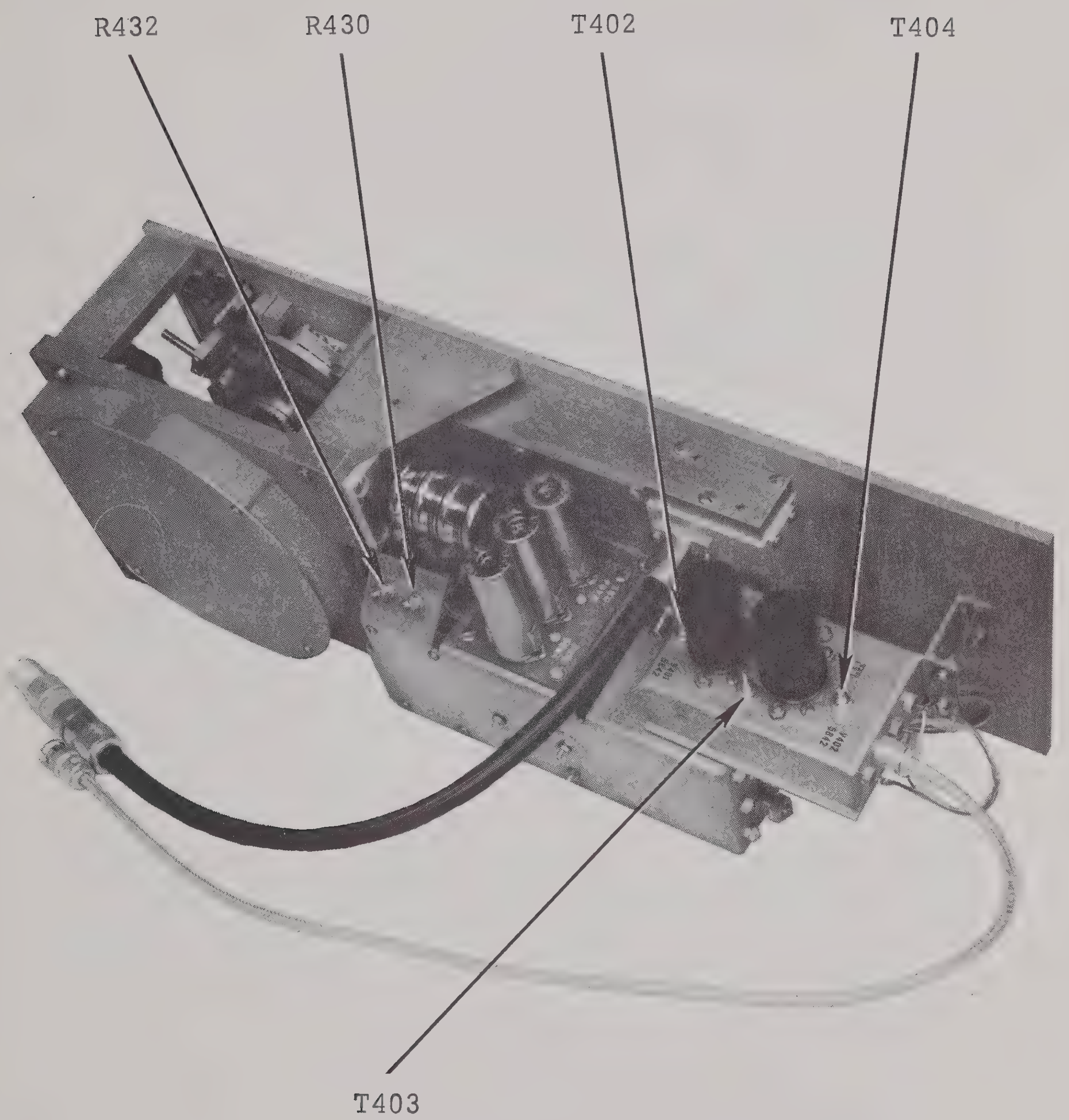


FIGURE 3-7. TYPICAL RF TUNER (BAND 4)

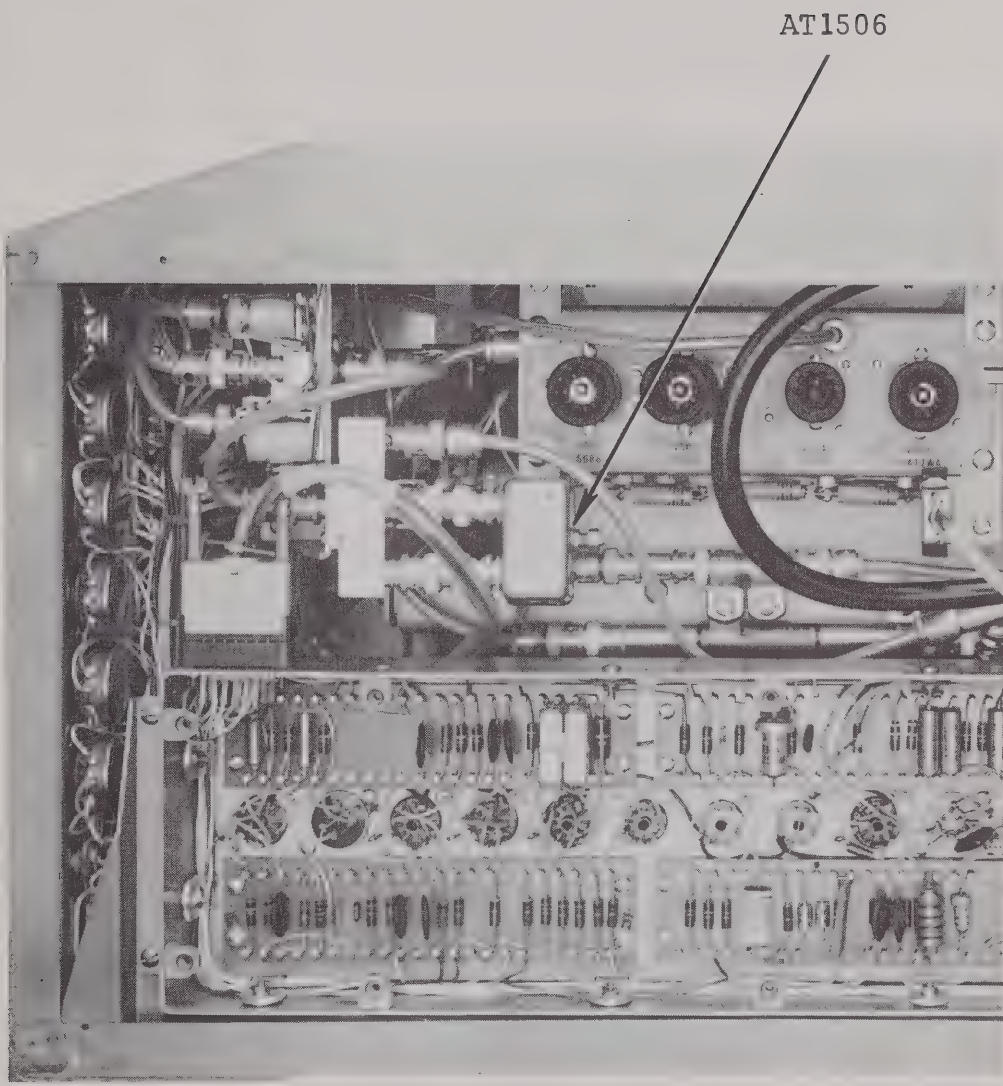


FIGURE 3-8. 20 DB IF ATTENUATOR ADJUSTMENT

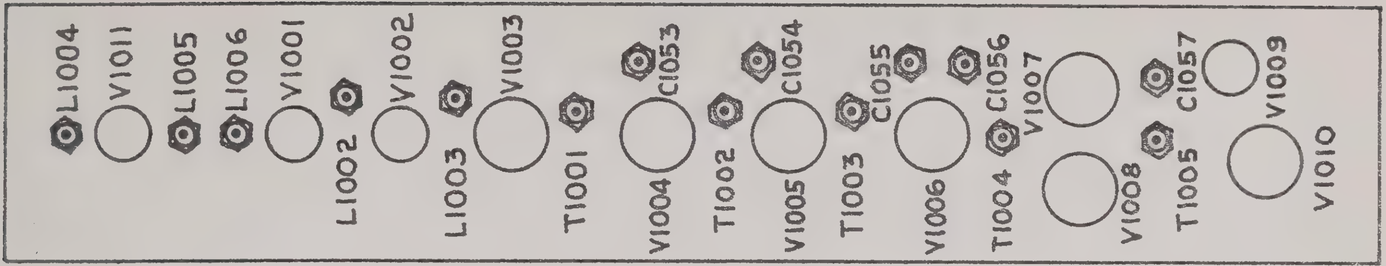


FIGURE 3-9

MAIN IF AMPLIFIER CHASSIS

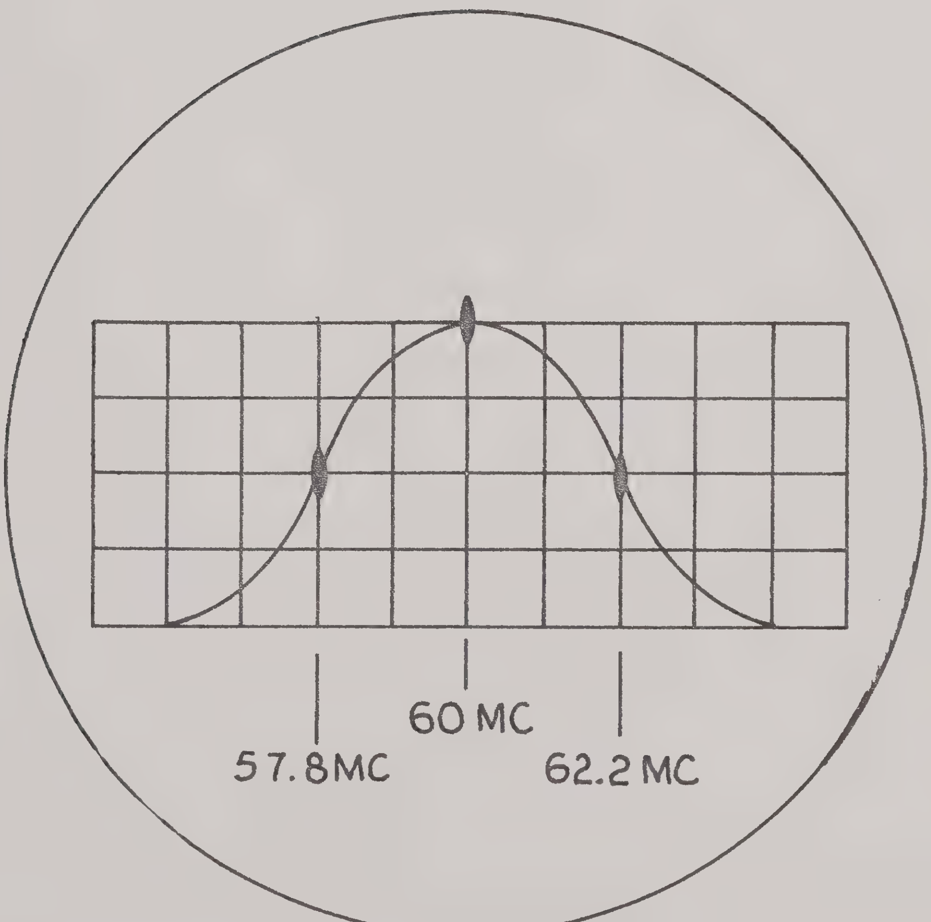


FIGURE 3-10

IF BANDPASS CURVE

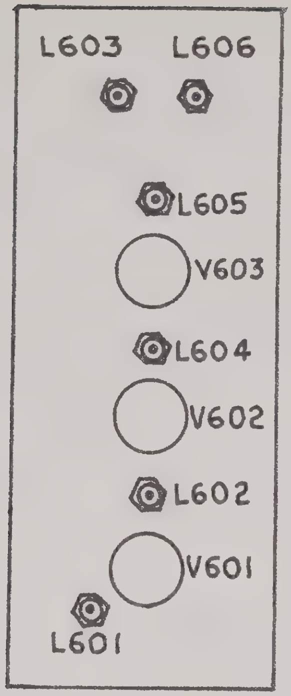


FIGURE 3-11
AFC IF CHASSIS

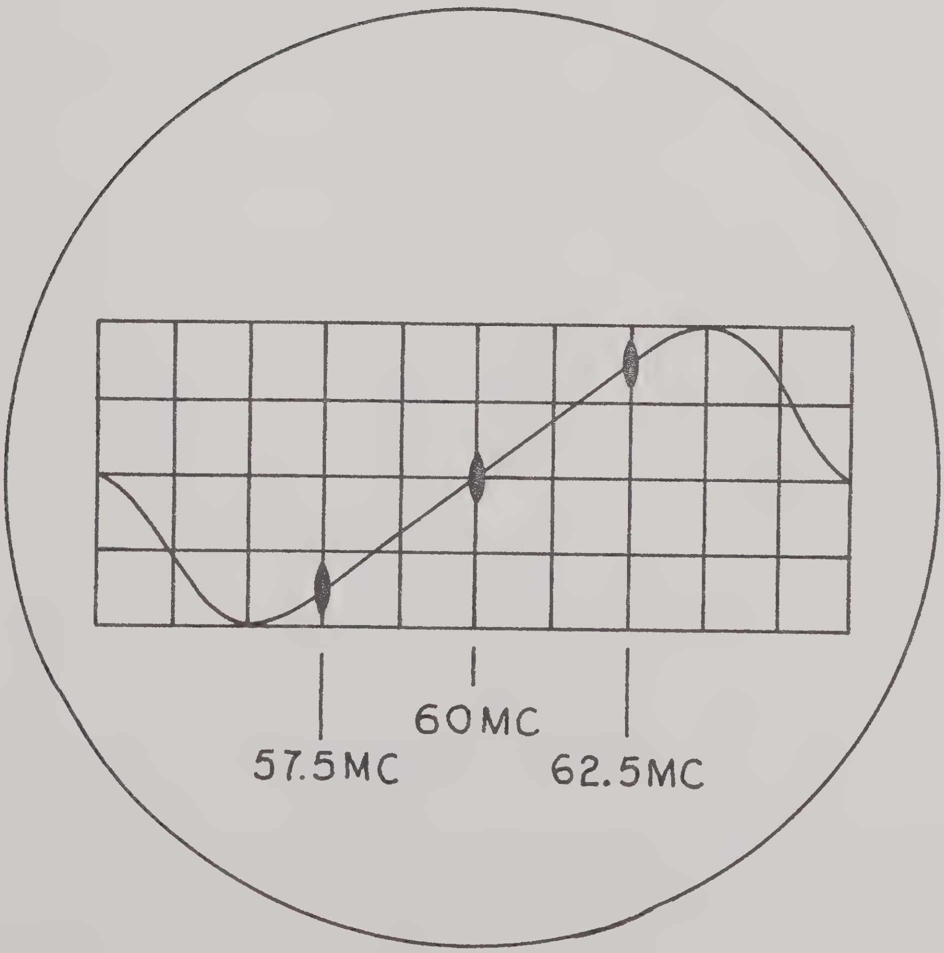


FIGURE 3-12
AFC DISRIMINATOR CURVE

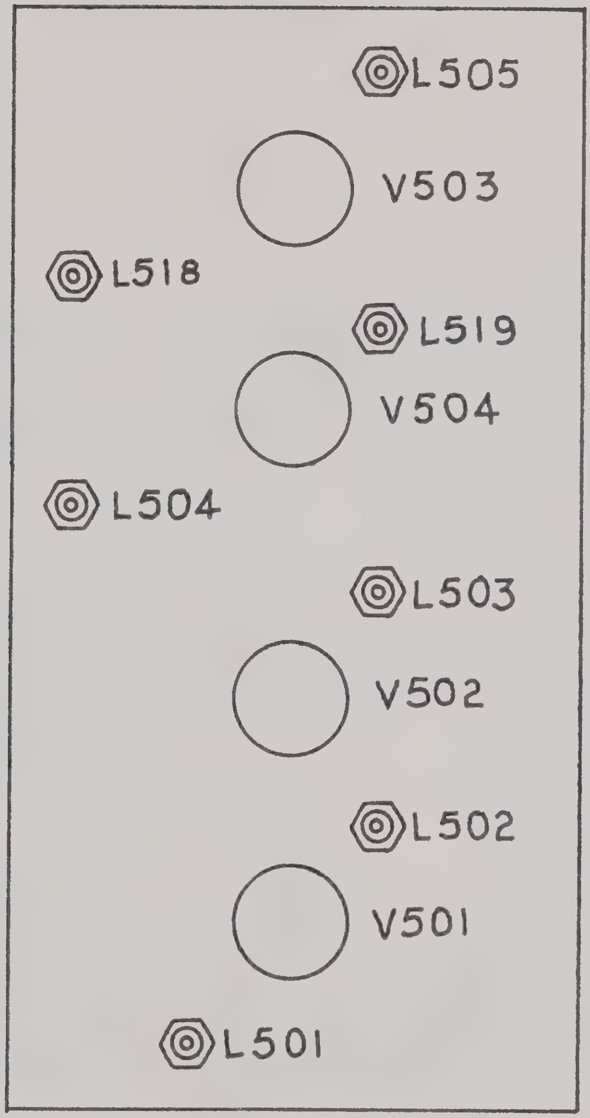


FIGURE 3-13

1ST IF AND CONVERTER CHASSIS

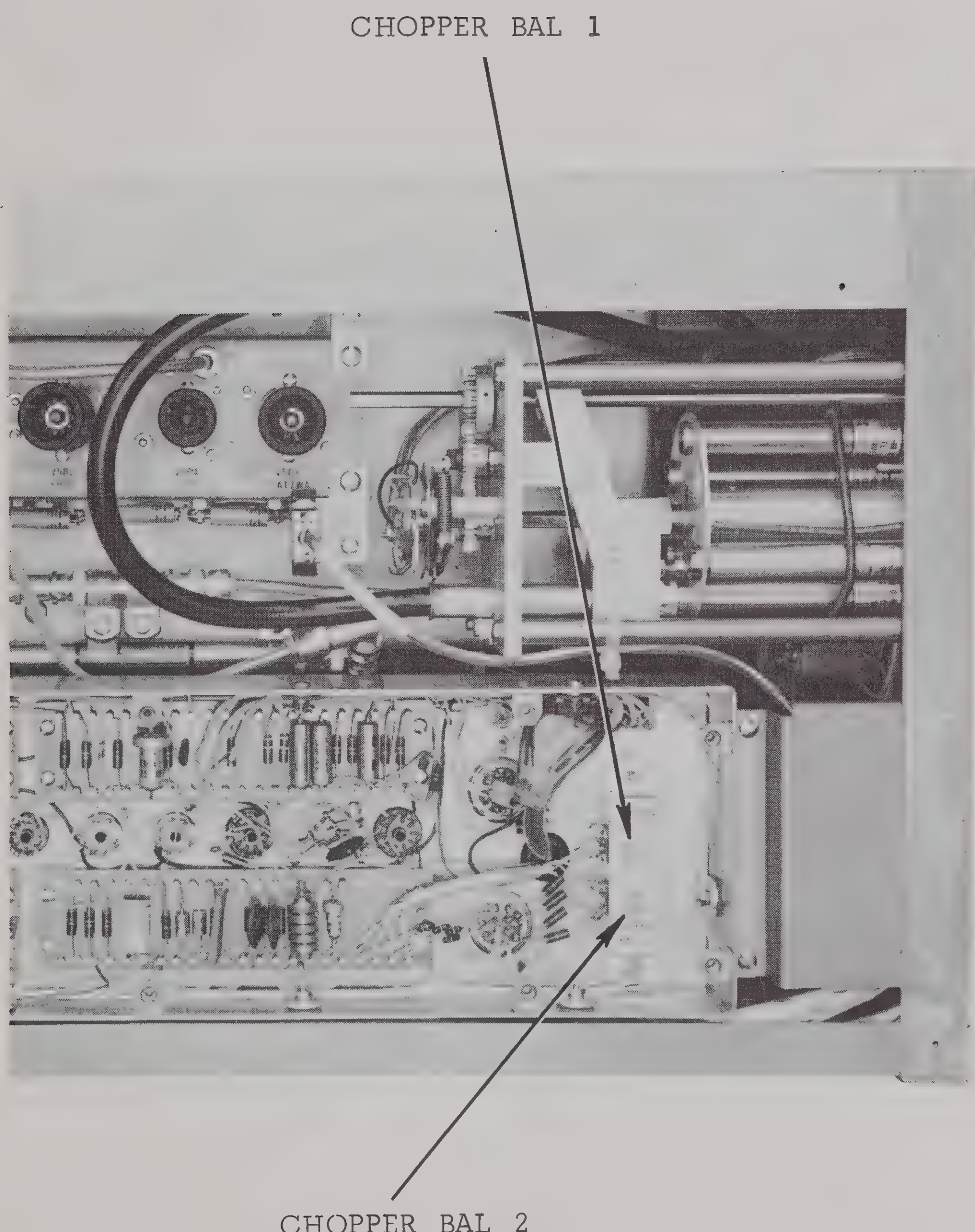


FIGURE 3-14. CHOPPER BALANCE ADJUSTMENTS

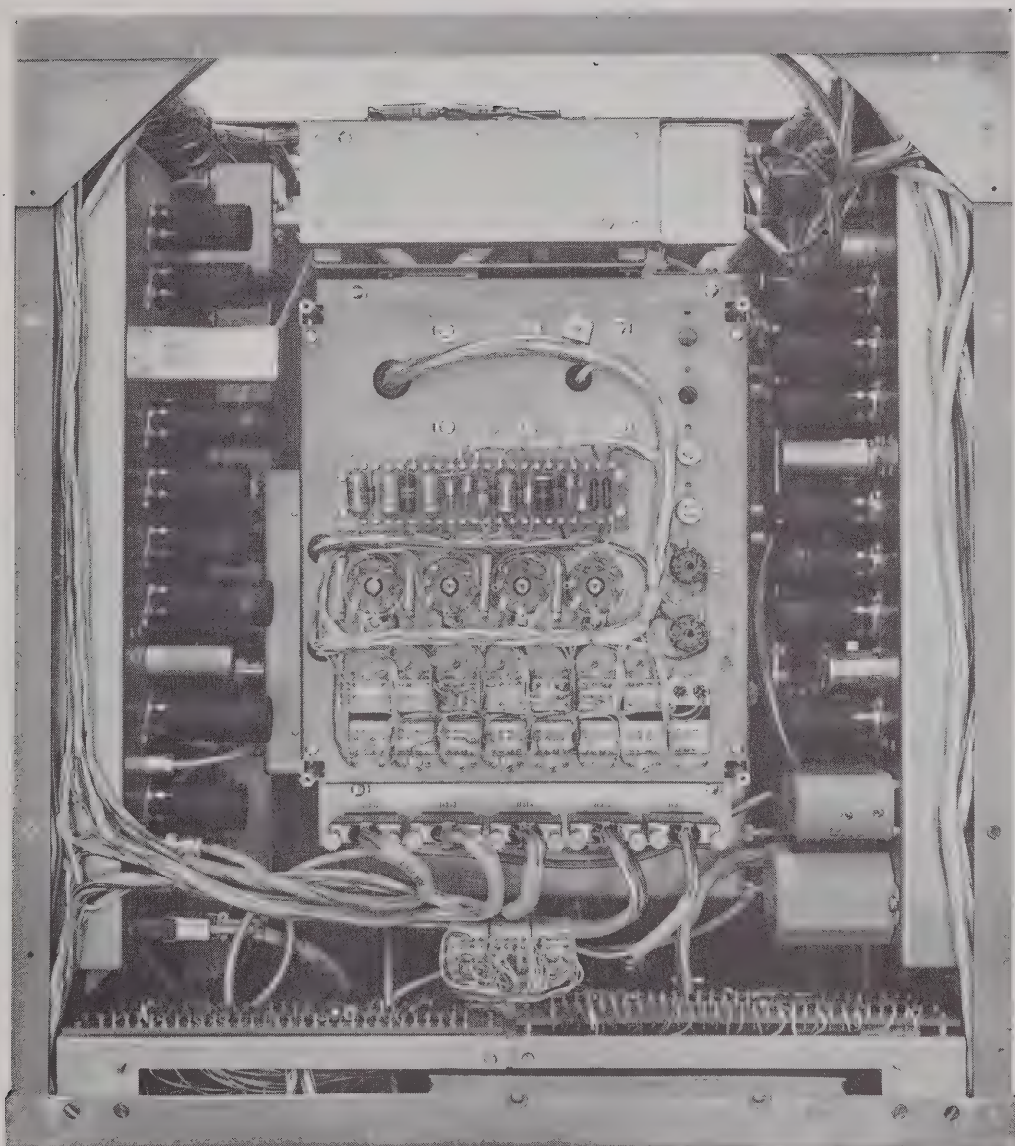


FIGURE 3-15. NM62B - BOTTOM VIEW

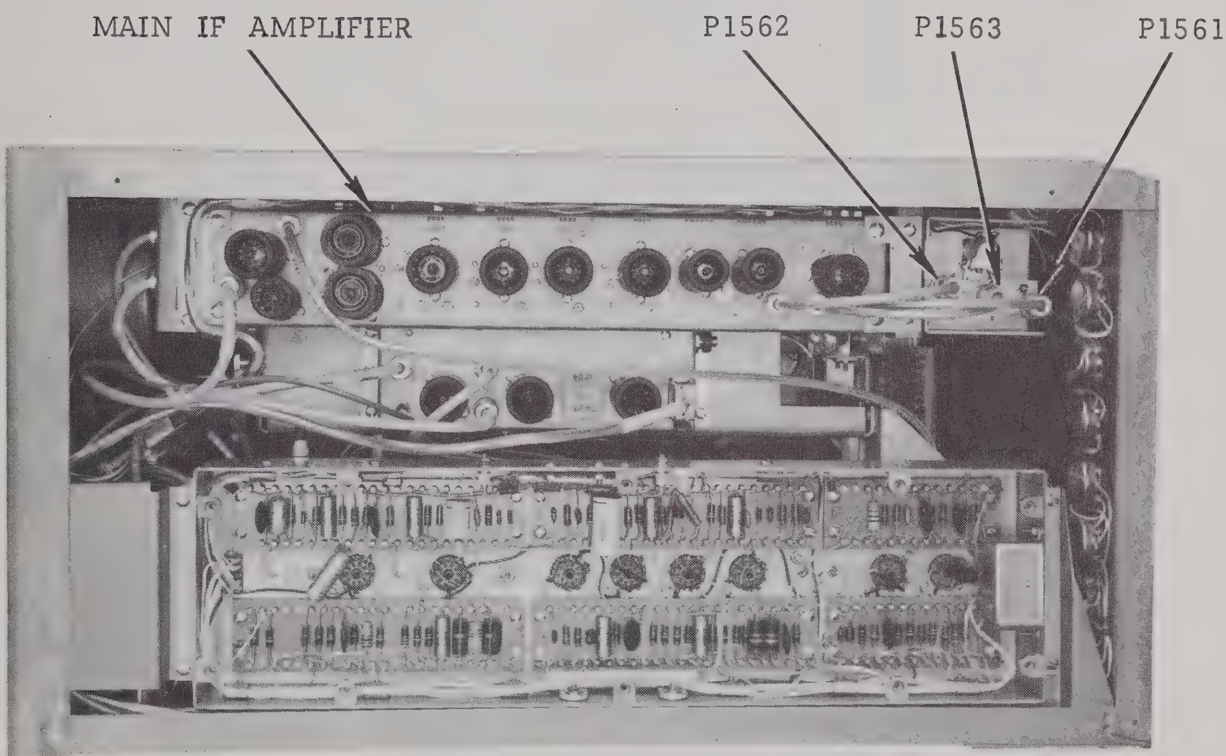


FIGURE 3-16. CONNECTIONS FOR DYNAMIC RANGE ADJUSTMENTS

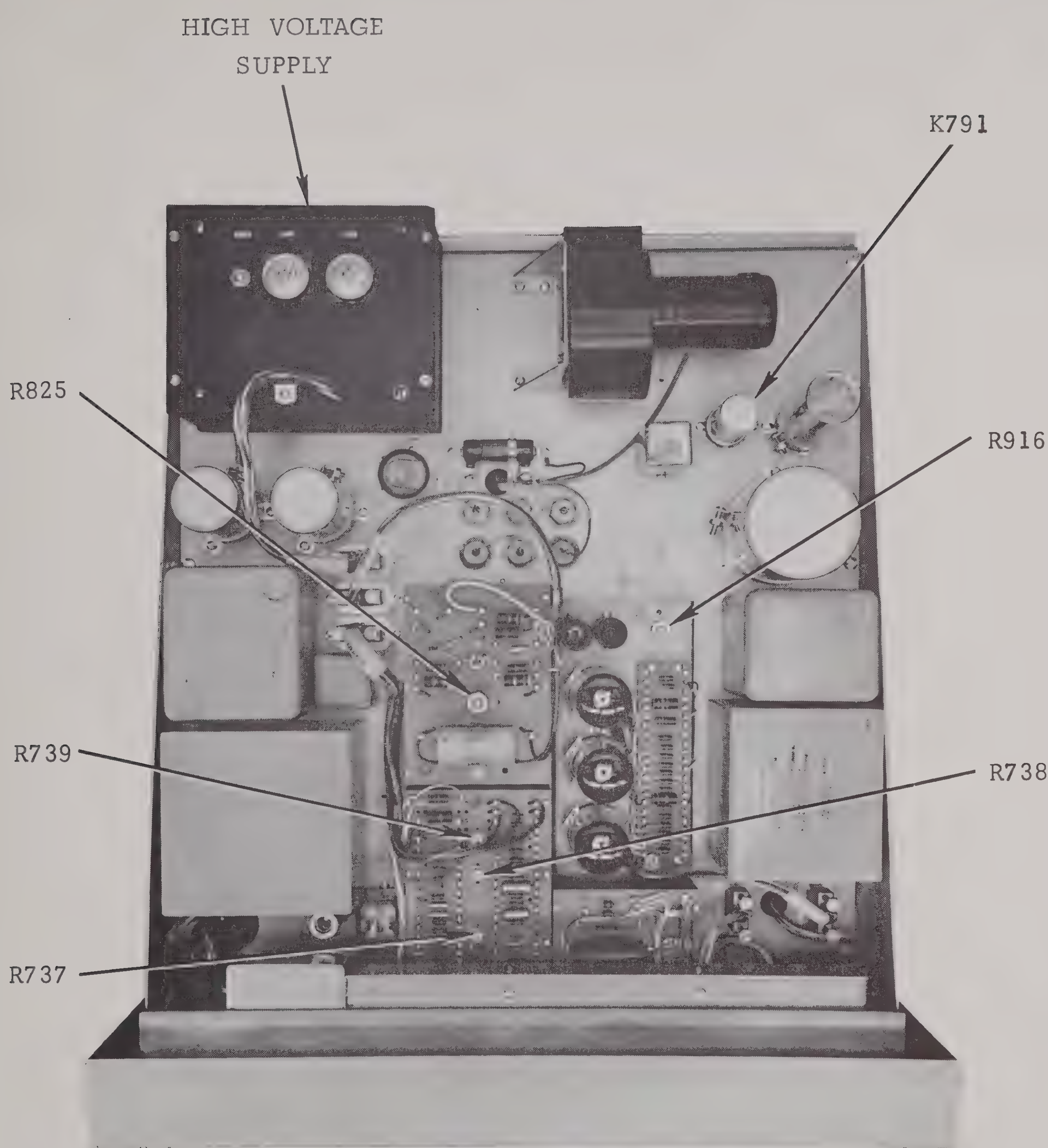


FIGURE 3-17. POWER SUPPLY - TOP VIEW

BAND I TUNER

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
AT101	ATTENUATOR: 10 db attenuation	Stoddart 90511-10	90511-10
B101	MOTOR, CONTROL: incl/filter Z104	Globe Elec. 43A523 w/40-S-252-filter	92265-1
C101	CAPACITOR, FIXED, CERAMIC: feedthru type; 1,000 mmf	Allen Bradley FB2B-102W	11684
C102	Same as C101		
C103	Same as C101		
C104	CAPACITOR, FIXED, CERAMIC: disc type; 2,000 mmf; 500 vdcw	Erie Resistor Corp. 801-0.002	10668
C105	Same as C104		
C106	Same as C104		
C107	CAPACITOR, FIXED, CERAMIC: standoff type; 1,000 mmf; 500 vdcw	Sprague Electric 507-C-1000	10665
C108	Same as C107		
C109	Same as C107		
C110	Same as C107		
C111	Same as C107		
C112	Same as C107		
C113	CAPACITOR, FIXED, CERAMIC: 50 mfd; ± 10 %	Erie Resistor Corp. U2M	11713
C114	Same as C113		
C115	CAPACITOR, FIXED, CERAMIC: 20,000 mmf; 500 vdcw; disc type	Erie Resistor Style 841-000-ZV203P	11767
C116	Same as C115		
C117	Same as C101		
C118	CAPACITOR, FIXED, CERAMIC: 20,000 mmf ± 20 %; 1,000 vdcw	Sprague Electric 5GA-S20	11765
C119	Same as C118		
C120	Same as C104		
C121	Same as C104		
C122	Not used		
C123	Not used		
C124	Same as C115		
C125	Same as C115		
CR101	SEMICONDUCTOR DEVICE DIODE: type 1N459	Texas Inst. 1N459	1N459
CR102	Same as CR101		
CR103	SEMICONDUCTOR DEVICE DIODE: type 1N21E	Sylvania Elec. 1N21E	1N21E
E101	SHIELD ELECTRON TUBE: incl/liner and outer shield	Stoddart 92439-1	92439-1
E102	Same as E101		
E103	Not used		
C104	SHIELD, ELECTRON TUBE: JAN type TS102U03	Elco Mfg. TS102U03	10039
E105	Same as E104		
E106	Same as E104		
FL101	FILTER LOW-PASS: incl/J109 connector	Stoddart 92670-1	92670-1
I101	LAMP INCANDESCENT: pilot light; 6 to 8 v; 0.15 amp	GE No. 47	10051
J101	CONNECTOR, RECEPTACLE: rectangular type 20 contacts	Winchester Elec. Corp. MRE-20P-J	11768
J102	CONNECTOR, RECEPTACLE: P/O Z102 crystal mixer (for ref. only)		
J103	CONNECTOR, RECEPTACLE: P/O AT101 Attenuator (for ref. only)		
J104	Same as J103		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
J105	JACK, TIP: single female contact; yellow color	E. F. Johnson 105-207-100	11761-207
J106	JACK, TIP: single female contact; blue color	E. F. Johnson 105-205-100	11761-205
J107	JACK, TIP: single female contact; violet color	E. F. Johnson 105-212-100	11761-212
J108	CONNECTOR, RECEPTACLE: BNC type UG-88C/U	Amphenol UG-88C/U	11455
J109	CONNECTOR, RECEPTACLE: P/O FL101 low pass filter (for ref. only)		
L101	CHOKE, RADIO FREQUENCY: 2.7 μh	Delevan Electric	11799
L102	Same as L101		
L103	Same as L101		
L104	Same as L101		
L105	Same as L101		
L106	Same as L101		
L107	Same as L101		
MP101	CLUTCH, FRICTION:	Simplatrol Prod. Corp. FFC30-2-65-A	11947
P101	CONNECTOR PLUG: 4 female contacts; rd shape	Amphenol 91-MPF4L	11763
P102	CONNECTOR PLUG: single male contact	Stoddart 90399-2	90399-2
P103	Same as J108		
P104	Same as P102		
R101	RESISTOR, FIXED, COMPOSITION: 1 megohm; ± 5 %; 1/2 w	Allen Bradley EB-1055	10011-105
R102	Same as R101		
R103	Same as R101		
R104	RESISTOR, FIXED, COMPOSITION: 51 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5105	10011-510
R105 A,B,C	RESISTOR, VARIABLE: composition; 3 ganged - A sect. 5,000 ohms B sect. 50,000 ohms C sect. 10,000 ohms	Duncan 1500-602	18152
R106	RESISTOR, FIXED, COMPOSITION: 82,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-8235	10011-823
R107	RESISTOR, FIXED, COMPOSITION: 27 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2705	10011-270
R108	RESISTOR, FIXED, COMPOSITION: 3,900 ohms; ± 5 %; 2 w	Allen Bradley HB-3925	10377-392
R109	RESISTOR, FIXED, COMPOSITION: 12 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1205	10011-120
R110	Same as R107		
R111	Same as R108		
R112	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1015	10011-101
R113	Same as R109		
R114	RESISTOR, FIXED, COMPOSITION: 3,600 ohms; ± 5 %; 1/2 w	Allen Bradley EB-3625	10011-362
R115	RESISTOR, VARIABLE: composition; 25,000 ohms; ± 10 %; 2 w	Allen Bradley JA1N032S253UA	11758
R116	RESISTOR, FIXED, COMPOSITION: 91,000 ohms; ± 5 %; 1 w	Allen Bradley GB-9135	10012-913
R117	Same as R115		
R118	Same as R112		
R119	RESISTOR, FIXED, FILM: 27,000 ohms; ± 1 %; 1/2 w	IRC - DCC - 1 %-6216	18286
R120	RESISTOR, VARIABLE: composition; 2,500 ohms;	Ohmite type AS-3605	18151
R121	Same as R120		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R122	RESISTOR, FIXED, COMPOSITION: 200 ohms; ± 5%; 1/2 w	Allen Bradley EB-2015	10011-201
S101	SWITCH, SENSITIVE: limit switch	Micro Switch 11SM1-T	11846
S102	Same as S101		
S103	SWITCH, ROTARY: spst; 3 amps; 250 v	Arrow, Hart and Hegeman 1561B	11968
T101	TRANSFORMER, POWER: step-down primary 6.3 vac 50 to 400 cycles; secondary 6.3 vac, 0.75 amps	Stoddart 11764	11764
T102	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-2	92277-2
T103	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-1	92277-1
T104	Same as T103		
V101	ELECTRON TUBE: type 5842	RCA 5842	5842
V102	Same as V101		
V103	ELECTRON TUBE: klystron; type 6BM6	Sylvania 6BM6	6BM6
V104	ELECTRON TUBE: voltage regulator	RCA type OB2	OB2
V105	Same as V104		
V106	ELECTRON TUBE: voltage regulator	RCA type OA2	OA2
W101	CABLE ASSEMBLY, RADIO FREQUENCY: 10-1/2 in. lg., RG-55/U cable; terminated by P102 and P103 at each end	Stoddart 92648-1	92648-1
XI101	LAMPHOLDER: bayonet style socket	Lee Craft Mfg. 708	10052
XV101	SOCKET, ELECTRON TUBE: 9 pin; bottom mtg mica filled	Cinch Mfg. 9EM	11705
XV102	Same as XV101		
XV103	Not used (Ref. P101)		
XV104	SOCKET, ELECTRON TUBE: 7 pin; mica filled	JAN type TS102P01-235-BC	11707
XV105	Same as XV104		
XV106	Same as XV104		
Z101	PRESELECTOR ASSEMBLY: (For ref. only)		
Z102	MIXER, ASSEMBLY: (For ref. only)		
Z103	PRE-AMPLIFIER ASSEMBLY: (For ref. only)		
Z104	FILTER ASSEMBLY: p/o B101 motor (For ref. only)		

BAND 2 TUNER

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
B201	MOTOR CONTROL: incl/filter Z204	Globe Elect. 43A523 w/ 40-S-252 filter	92265-1
C201	CAPACITOR, FIXED, CERAMIC: feed thru type; 1000 mmf	Allen Bradley FB2B-102W	11684
C202	Same as C201		
C203	Same as C201		
C204	CAPACITOR, FIXED, CERAMIC: disc type; 2000 mmf; +100 % -0 %; 500 vdcw	Erie 801-0.002	10668
C205	Same as C204		
C206	Same as C204		
C207	CAPACITOR, FIXED, CERAMIC: standoff type; 1000 mmf; 500 vdcw	Sprague 507-C-1000	10665
C208	Same as C207		
C209	Same as C207		
C210	Same as C207		
C211	Same as C207		
C212	Same as C207		
C213	CAPACITOR, FIXED, CERAMIC: 50 mmf; ± 10 %	Erie U2M	11713
C214	Same as C213		
C215	CAPACITOR, FIXED, CERAMIC: disc type; 20,000 mmf; 500 vdcw	Erie style 841-000-ZV203P	11767
C216	Same as C215		
C217	Same as C201		
C218	CAPACITOR, FIXED, CERAMIC: 20,000 mmf; ± 20 %; 1000 vdcw	Sprague 5GA-S20	11765
C219	Same as C218		
C220	Same as C204		
C221	Same as C204		
C222	Not used		
C223	Not used		
C224	Same as C215		
C225	Same as C215		
CR201	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N459	1N459
CR202	Same as CR201		
CR203	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N23E	1N23E
E201	SHIELD, ELECTRON TUBE: incl/liner and outer shield	Stoddart 92439-1	92439-1
E202	Same as E201		
E203	Not used		
E204	SHIELD, ELECTRON TUBE: JAN type TS102U03	Elco Mfg. TS102U03	10039
E205	Same as E204		
E206	Same as E204		
FL201	FILTER, LOW-PASS: incl/J207 connector	Stoddart 92672-1	92672-1
I201	LAMP, INCANDESCENT: pilot light; 6 to 8 v; 0.15 amp	GE No. 47	10051
J201	CONNECTOR, RECEPTACLE: rectangular type; 20 contacts	Winchester Elect. Corp MRE-20P-J	11768
J202	CONNECTOR, RECEPTACLE: P/O Z202, crystal mixer (For ref. only)		
J203	JACK, TIP: single female contact; blue color	E. F. Johnson 105-205-100	11761-205
J204	JACK, TIP: female single contact; yellow color	E. F. Johnson 105-207-100	11761-207

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
J205	JACK, TIP: single female contact; violet color	E. F. Johnson 105-212-100	11761-212
J206	CONNECTOR, RECEPTACLE: BNC type UG-88c/u	Amphenol UG-88c/u	11455
J207	CONNECTOR, RECEPTACLE: P/O FL201 filter (For ref. only)		
L201	CHOKE, RADIO FREQUENCY: 2.7 μh	Delevan Elect.	11799
L202	Same as L201		
L203	Same as L201		
L204	Same as L201		
L205	Same as L201		
L206	Same as L201		
L207	Same as L201		
MP201	CLUTCH, FRICTION:	Simplatrol Products FFC30-2-65-A	11947
P201	CONNECTOR, PLUG: 4 female contacts	Amphenol 91-MPF4L	11763
P202	CONNECTOR, PLUG: P/O W201 cable assembly (For ref. only)		
R201	RESISTOR, FIXED, COMPOSITION: 1,000,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1055	10011-105
R202	Same as R201		
R203	Same as R201		
R204	RESISTOR, FIXED, COMPOSITION: 51 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5105	10011-510
R205 A,B,C	RESISTOR, VARIABLE: composition; 3 ganged A-sect. 5,000 ohms B-sect. 50,000 ohms C-sect. 10,000 ohms	Duncan 1500-602	18152
R206	RESISTOR, FIXED, COMPOSITION: 82,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-8235	10011-823
R207	RESISTOR, FIXED, COMPOSITION: 27 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2705	10011-270
R208	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ± 5 %; 2 w	Allen Bradley HB-3925	10377-392
R209	RESISTOR, FIXED, COMPOSITION: 12 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1205	10011-120
R210	Same as R207		
R211	Same as R208		
R212	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1015	10011-101
R213	Same as R209		
R214	Same as R212		
R215	RESISTOR, VARIABLE: composition; 25,000 ohms; ± 10 %; 2 w	Allen Bradley JA1N032 S253UA	11758
R216	RESISTOR, FIXED, COMPOSITION: 6800 ohms; ± 5 %; 1/2 w	Allen Bradley EB-6825	10011-682
R217	Same as R215		
R218	RESISTOR, FIXED, FILM: 191,000 ohms; ± 1 %; 1/2 w.	IRC type MIL-RN20	18283
R219	RESISTOR, VARIABLE: composition; 2500 ohms	Ohmite type AS-3605	18151
R220	Same as R219		
R221	RESISTOR, FIXED, FILM: 1000 ohms; ± 1 %; 1/2 w	IRC type MIL-RN20	18284
R222	RESISTOR, FIXED, COMPOSITION: 200 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2015	10011-201

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
S201	SWITCH, SENSITIVE: limit switch	Microswitch 11SM1-T	11846
S202	Same as S201		
S203	SWITCH, ROTARY: spst; 3 amp; 250 v	Arrow, Hart and Hegeman 1561B	11968
T201	TRANSFORMER, POWER, STEPDOWN: primary, 6.3 vac; 50 to 400 cycles; secondary, 6.3 vac, 0.75 amps	Stoddart 11764	11764
T202	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-2	92277-2
T203	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-1	92277-1
T204	Same as T203		
V201	ELECTRON TUBE: type 5842	GE - 5842	5842
V202	Same as V201		
V203	ELECTRON TUBE: klystron; type 6BL6	Sylvania 6BL6	6BL6
V204	ELECTRON TUBE: voltage regulator	RCA type OB2	OB2
V205	Same as V204		
V206	ELECTRON TUBE: voltage regulator	RCA type OA2	OA2
W201	CABLE ASSEMBLY RADIO FREQUENCY: incl/P202 on one end, other end not processed	Stoddart 92851-1	92851-1
XI201	LAMPHOLDER: bayonet style socket	Lee Craft Mfg. 708	10052
XV201	SOCKET, ELECTRON TUBE: 9 pin, bottom mtg; mica filled	Cinch Mfg.	11705
XV202	Same as XV201		
XV203	Not used (Ref. P201)		
XV204	SOCKET, ELECTRON TUBE: 7 pin; mica filled	JAN type TS102P01-235-BC	11707
XV205	Same as XV204		
XV206	Same as XV204		
Z201	PRESELECTOR, ASSEMBLY: (For ref. only)		
Z202	MIXER ASSEMBLY: (For ref. only)		
Z203	PRE-AMPLIFIER ASSEMBLY: (For ref. only)		
Z204	FILTER ASSEMBLY: p/o B101 motor (For ref. only)		

BAND 3 TUNER

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
B301	MOTOR, CONTROL: incl/filter Z304	Globe Elect. 43A524 w/ 40-S-252 filter	11940-2
C301	CAPACITOR, FIXED, CERAMIC: feed thru type; 1,000 mmf	Allen Bradley FB2B-102W	11684
C302	Same as C301		
C303	Same as C301		
C304	CAPACITOR, FIXED, CERAMIC: disc type; 2,000 mmf; +100 %; -0 % 500 vdcw	Erie Resistor Corp. 801-0.002	10668
C305	Same as C304		
C306	Same as C304		
C307	CAPACITOR, FIXED, CERAMIC: standoff type; 1,000 mmf; 500 vdcw	Sprague Elect. 507-C-1,000	10665
C308	Same as C307		
C309	Same as C307		
C310	Same as C307		
C311	Same as C307		
C312	Same as C307		
C313	CAPACITOR, FIXED, CERAMIC: 50 mmf; ± 10 %	Erie Resistor U2M	11713
C314	Same as C313		
C315	Same as C304		
C316	Same as C304		
C317	Same as C301		
C318	CAPACITOR, FIXED, CERAMIC: 20,000 mmf; ± 20 %; 1,000 vdcw	Sprague Elect. 5GA-S20	11765
C319	CAPACITOR, FIXED, CERAMIC: 10,000 mmf; ± 20 %; 1000 vdcw	Sprague Elect. BL-S10	11766
C320	Same as C319		
C321	CAPACITOR, FIXED, CERAMIC: 20,000 mmf; 500 vdcw; disc type	Erie style 841-000-ZV203P	11767
C322	Same as C321		
C323	Same as C321		
C324	Same as C321		
CR301	SEMICONDUCTOR DEVICE DIODE: type 1N459	Texas Inst. 1N459	1N459
CR302	Same as CR301		
CR303	SEMICONDUCTOR DEVICE DIODE: type 1N23E	Sylvania 1N23E	1N23E
CR304	SEMICONDUCTOR DEVICE DIODE:	Texas Inst. 1N757	1N757
E301	SHIELD, ELECTRON TUBE: incl/liner and outer shield	Stoddart 92439-1	92439-1
E302	Same as E301		
E303	Not used		
E304	SHIELD, ELECTRON TUBE: JAN type TS102U03	Elco Mfg. TS102U03	10039
E305	Same as E304		
E306	Same as E304		
E307	Same as E304		
FL301	FILTER, LOW PASS: incl/J302 connector	Stoddart 92293-1	92293-1
I301	LAMP, INCANDESCENT: pilot light; 6 to 8 v; 0.15 amp	GE 47	10051
J301	CONNECTOR, RECEPTACLE: rectangular type; 20 contacts	Winchester Elect. Corp. MRE-20P-J	11768
J302	CONNECTOR, RECEPTACLE: p/o FL301 filter (For ref. only)		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
J303	CONNECTOR, RECEPTACLE: BNC type UG-88c/u	Amphenol UG-88c/u	11455
J304	JACK, TIP: single female contact; blue	E. F. Johnson 105-205-100	11761-205
J305	JACK, TIP: single female contact; yellow	E. F. Johnson 105-207-100	11761-207
J306	JACK, TIP: single female contact; violet	E. F. Johnson 105-212-100	11761-212
L301	CHOKE, RADIO FREQUENCY: 2.7 µh	Delevan Electric 1840-16	11799
L302	Same as L301		
L303	Same as L301		
L304	Same as L301		
L305	Same as L301		
L306	Same as L301		
L307	Same as L301		
MP301	CLUTCH, FRICTION:	Simplatrol Prod. Corp. FFC30-2-65A	11947
P301	CONNECTOR, PLUG: 4 female contacts; rd shape	Amphenol 91-MPF4L	11763
R301	RESISTOR, FIXED, COMPOSITION: 1 meg ohm; ± 5 %; 1/2 w	Allen Bradley EB-1055	10011-105
R302	Same as R301		
R303	Same as R301		
R304	Not used		
R305 A,B,C	RESISTOR, VARIABLE: composition; 3 ganged, A-sect. 50,000 ohms B-sect. 5,000 ohms C-sect. 10,000 ohms	Duncan 1500-602	18152
R306	RESISTOR, FIXED, COMPOSITION: 91,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-9135	10011-913
R307	RESISTOR, FIXED, COMPOSITION: 27 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2705	10011-270
R308	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ± 5 %; 2 w	Allen Bradley HB-3925	10377-392
R309	RESISTOR, FIXED, COMPOSITION: 12 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1205	10011-120
R310	Same as R307		
R311	Same as R308		
R312	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1015	10011-101
R313	Same as R309		
R314	Same as R312		
R315	RESISTOR, VARIABLE: composition; 25,000 ohms; ± 10 %; 2 w	Allen Bradley JA1N032S 253UA	11758
R316	Same as R315		
R317	RESISTOR, FIXED, COMPOSITION: 51,000 ohms; ± 5 %; 2 w	Allen Bradley HB-5135	10377-513
R318	Same as R317		
R319	Same as R317		
R320	Same as R317		
R321	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5 %; 2 w	Allen Bradley HB-1045	10377-104
R322	Same as R321		
R323	RESISTOR, FIXED, WIREWOUND: 50,000 ohms; 10 w	Ward Leonard type 10XM	11896
R324	Same as R323		
R325	Not used		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R326	RESISTOR, FIXED, COMPOSITION: 200 ohms; ± 5%; 1/2 w	Allen Bradley EB-2015	10011-201
R327	Not used		
R328	Not used		
R329	Not used		
R330	RESISTOR, VARIABLE: composition; 2500 ohms	Ohmite type AS-3605	18151
R331	Same as R330		
R332	RESISTOR, FIXED, FILM: 3650 ohms; ± 1%; 1/2 w	IRC MIL type RN20	18285
S301	SWITCH SENSITIVE: limit switch	Microswitch 11SM1-T	11846
S302	Same as S301		
S303	SWITCH ROTARY: spst; 3 amp; 250 v	Arrow Hart and Hegeman 1561 B	11968
T301	TRANSFORMER, POWER, STEPDOWN: primary 6.3 vac, 50 to 400 cycles, secondary 6.3 vac, 0.75 amps	Stoddart 11772	11772
T302	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-2	92277-2
T303	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-1	92277-1
T304	Same as T303		
V301	ELECTRON TUBE: type 5842	RCA type 5842	5842
V302	Same as V301		
V303	ELECTRON TUBE: klystron; type 5721	Raytheon 5721	5721
V304	ELECTRON TUBE: voltage regulator	RCA type OB2	OB2
V305	ELECTRON TUBE: voltage regulator	RCA type OA2	OA2
V306	Same as V305		
V307	Same as V305		
XI301	LAMPHOLDER: bayonet style socket	Lee Craft Mfg. 708	10052
XV301	SOCKET, ELECTRON TUBE: 9 pin, bottom mtg; mica filled	Cinch Mfg. 9EM	11705
XV302	Same as XV301		
XV303	Not used (Ref. P301)		
XV304	SOCKET, ELECTRON TUBE: 7 pin; mica filled	JAN type TS102P01-235	11707
XV305	Same as XV304		
XV306	Same as XV304		
XV307	Same as XV304		
Z301	PRESELECTOR, ASSEMBLY: (For ref. only)		
Z302	MIXER ASSEMBLY: (For ref. only)		
Z303	PRE-AMPLIFIER ASSEMBLY: (For ref. only)		
Z304	FILTER ASSEMBLY: p/o B101 motor (For ref. only)		

BAND 4 TUNER

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
B401	MOTOR CONTROL: incl/filter Z404	Globe Elect. 43A524 w/ 40-S-252 filter	11940-2
C401	CAPACITOR, FIXED, CERAMIC: feedthru type; 1000 pf	Allen Bradley FB2B-102W	11684
C402	Same as C401		
C403	Same as C401		
C404	CAPACITOR, FIXED, CERAMIC: disc type; 2000 pf; +100 % -0 %; 500 vdcw	Erie 801-0.002	10668
C405	Same as C404		
C406	Same as C404		
C407	CAPACITOR, FIXED, CERAMIC: standoff type; 1000 pf; 500 vdcw	Sprague 507-C-1000	10665
C408	Same as C407		
C409	Same as C407		
C410	Same as C407		
C411	Same as C407		
C412	Same as C407		
C413	CAPACITOR, FIXED, CERAMIC: 50 pf; ± 10 %	Erie U2M	11713
C414	Same as C413		
C415	Same as C413		
C416	Same as C413		
C417	Same as C401		
C418	CAPACITOR, FIXED, CERAMIC: 10,000 pf; ± 20 %; 2000 vdcw	Sprague BL-S10	11766
C419	Same as C418		
C420	Same as C418		
C421	CAPACITOR, FIXED, CERAMIC: disc type; 20,000 pf; 500 vdcw	Erie PZ5V	11767
C422	Same as C421		
C423	Same as C421		
C424	Same as C421		
CR401	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N459	1N459
CR402	Same as CR401		
CR403	SEMICONDUCTOR DEVICE, DIODE:	1N2510 Sylvania	1N2510
E401	SHIELD, ELECTRON TUBE: incl/liner and outer shield	Stoddart 92439-1	92439-1
E402	Same as E401		
E403	Not used		
E404	SHIELD, ELECTRON TUBE: JAN type TS102U03	Elco Mfg. TS102U03	10039
E405	Same as E404		
E406	Same as E404		
FL401	FILTER, LOW PASS: incl/J402 connector	Stoddart 92675-1	92675-1
I401	LAMP, INCANDESCENT: pilot light; 6 to 8 v; 0.15 amp	GE 47	10051
J401	CONNECTOR, RECEPTACLE: rectangular type; 20 contacts	Winchester MRE-20P-J	11768
J402	CONNECTOR, RECEPTACLE: p/o W401 cable assembly; (For ref. only)		
J403	CONNECTOR, RECEPTACLE: BNC type UG-88c/u	Amphenol UG-88c/u	11455
J404	JACK, TIP: single female, contact; blue color	E. F. Johnson 105-205-100	11761-205
J405	JACK, TIP: single female, contact; yellow color	E. F. Johnson 105-207-100	11761-207

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
J406	JACK, TIP: single female, contact; violet color	E. F. Johnson 105-212-100	11761-212
J407	CONNECTOR, RECEPTACLE: p/o FL401 filter (For ref. only)		
L401	CHOKE, RADIO FREQUENCY: 2.7 μh	Delevan Elect. 1840-16	11799
L402	Same as L401		
L403	Same as L401		
L404	Same as L401		
L405	Same as L401		
L406	Same as L401		
L407	Same as L401		
MP401	CLUTCH, FRICTION:	Simplatrol FFC30-2-65A	11947
P401	CONNECTOR, PLUG: 3 female contacts; rd shape	Amphenol 91-MPF3L	11769
P402	CONNECTOR, PLUG: p/o W401 cable assembly (For ref. only)		
R401	RESISTOR, FIXED, COMPOSITION: 1 meg ohm; ± 5 %; 1/2 w	Allen Bradley EB-1055	10011-105
R402	Same as R401		
R403	Same as R401		
R404	Not used		
R405 A,B,C	RESISTOR, VARIABLE: composition; 3 ganged, A-sect. 5,000 ohms B-sect. 50,000 ohms C-sect. 10,000 ohms	Duncan 1500-602	18152
R406	RESISTOR, FIXED, COMPOSITION: 82,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-8235	10011-823
R407	RESISTOR, FIXED, COMPOSITION: 27 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2705	10011-270
R408	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ± 5 %; 1/2 w	Allen Bradley HB-3925	10377-392
R409	RESISTOR, FIXED, COMPOSITION: 12 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1205	10011-120
R410	Same as R407		
R411	Same as R408		
R412	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1015	10011-101
R413	Same as R409		
R414	Same as R412		
R415	RESISTOR, VARIABLE: composition; 25,000 ohms; ± 10 %; 2 w	Allen Bradley JA1N032 S253UA	11758
R416	Same as R415		
R417	RESISTOR, FIXED, COMPOSITION: 5,100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5125	10011-512
R418	Same as R417		
R419	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1045	10011-104
R420	Same as R419		
R421	Same as R419		
R422	Same as R419		
R423 thru R429	Not used		
R430	RESISTOR, VARIABLE: composition; 2500 ohms	Ohmite type AS-3605	18151

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R431	RESISTOR, FIXED, COMPOSITION: 2000 ohms; ± 1%; 1/2 w	IRC MIL type RN20	18154
R432	Same as R430		
R433	Not used		
R434	RESISTOR, FIXED, COMPOSITION: 6190 ohms; ± 1%; 1/2 w	IRC MIL type RN20	18153
R435	RESISTOR, FIXED, COMPOSITION: 200 ohms; ± 5%; 1/2 w	Allen Bradley EB-2015	10011-201
S401	SWITCH, SENSITIVE: limit switch	Microswitch 11SM1-T	11846
S402	Same as S401		
S403	SWITCH, ROTARY: spst; 3 amp; 250 v	Arrow, Hart and Hegeman 1561B	11968
T401	TRANSFORMER, POWER, STEPDOWN: primary 6.3 vac, 50 to 400 cycles; secondary 6.3 vac, 0.75 amps	Stoddart 11772	11772
T402	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-2	92277-2
T403	TRANSFORMER, RADIO FREQUENCY: slug tuned	Stoddart 92277-1	92277-1
T404	Same as T403		
V401	ELECTRON TUBE: triode	RCA 5842	5842
V402	Same as V401		
V403	ELECTRON TUBE: klystron	Raytheon 2K48	2K48
V404	ELECTRON TUBE: voltage regulator	RCA OB2	OB2
V405	Same as V404		
V406	ELECTRON TUBE: voltage regulator	RCA OA2	OA2
W401	CABLE ASSEMBLY, RADIO FREQUENCY: incl/P402 on one end, other end not processed	Stoddart 93425-1	93425-1
W402	CABLE ASSEMBLY, RADIO FREQUENCY: incl/J402 on one end, other end not processed	Loral Mfg. 53-1114	11814
XI401	LAMPHOLDER: bayonet style base	Lee Craft 708	10052
XV401	SOCKET, ELECTRON TUBE:	Cinch 9EM	11705
XV402	Same as XV401		
XV403	Not used (Ref. P401)		
XV404	SOCKET, ELECTRON TUBE: 7 pin; mica filled	JAN type TS102P01-235-BC	11707
XV405	Same as XV404		
XV406	Same as XV404		
Z401	PRESELECTOR, ASSEMBLY: (For ref. only)		
Z402	MIXER ASSEMBLY: (For ref. only)		
Z403	PRE-AMPLIFIER ASSEMBLY: (For ref. only)		
Z404	FILTER ASSEMBLY: p/o B101 motor (For ref. only)		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C501	CAPACITOR, FIXED, CERAMIC: disc type; 2000 pf	Erie 801-0.002	10668
C502 thru C512	Same as C501		
C513	CAPACITOR, FIXED, CERAMIC: 50 pf; ± 10 %; 500 vdcw	Erie U2M	11713
C514	Same as C513		
C515	CAPACITOR, FIXED, CERAMIC: 200 pf; ± 20 %; 500 vdcw	Erie GP2K-201	10667-201
C516	Not used		
C517	CAPACITOR, FIXED, CERAMIC: feed thru type 1000 pf	Allen Bradley FB2B-10244	11684
C518 thru C526	Same as C517		
C527	CAPACITOR, FIXED, CERAMIC: standoff type; 1000 pf	Sprague 507-C-1000	10665
C528	Same as C527		
C529	Same as C527		
C530	Same as C527		
C531	Same as C517		
C532	Same as C527		
C533	Same as C527		
C534	Same as C527		
C535	CAPACITOR, FIXED, CERAMIC: disc type; 10 pf; 1000 vdcw	Sprague 10TCQ10	11698
C536	Same as C535		
C537	Same as C501		
E501	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elec. Research TR66015B	11340
E502	Same as E501		
E503	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elec. Research TR66020B	11339
E504	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elec. Research TR55015B	11343
L501	COIL, RADIO FREQUENCY: 160 Mc; IF input	Stoddart 92285-7	92285-7
L502	COIL, INTERMEDIATE FREQUENCY: 160 Mc	Stoddart 92285-11	92285-11
L503	COIL, INTERMEDIATE FREQUENCY: 160 Mc	Stoddart 92285-8	92285-8
L504	COIL, INTERMEDIATE FREQUENCY: tapped	Stoddart 92285-9	92285-9
L505	COIL, INTERMEDIATE FREQUENCY: 73.33 Mc	Stoddart 92285-10	92285-10
L506	COIL, RADIO FREQUENCY: 0.22 µh, choke coil	Delevan Elec. 1840-02	11702
L507 thru L511	Same as L506		
L512	COIL, RADIO FREQUENCY: 1.2 µh, choke coil	Delevan Elec. 2890-00	11703
L513	Same as L512		
L514	Same as L512		
L515	COIL, RADIO FREQUENCY: 2.7 µh; choke coil	Delevan Elec. 1840-16	11799
L516	Same as L515		
L517	COIL, RADIO FREQUENCY: 220 Mc; tripler coil	Stoddart 51580	51580
L518	Same as L505		
L519	Same as L503		
L520	Same as L515		
L521	COIL, RADIO FREQUENCY: 5.6 µh, choke coil	Delevan Elec. 2150-18	11704
R501	RESISTOR, FIXED, COMPOSITION: 75 ohms; ± 5 %; 1/2 w	Allen Bradley EB-7505	10011-750
R502	Same as R501		
R503	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1015	10011-101
R504	Same as R503		
R505	Same as R503		
R506	Same as R503		
R507	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1005	10011-100
R508	Same as R507		
R509	Same as R507		
R510	RESISTOR, FIXED, COMPOSITION: 9100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-9125	10011-912
R511	Same as R510		
R512	RESISTOR, FIXED, COMPOSITION: 8200 ohms; ± 5 %; 1/2 w	Allen Bradley EB-8225	10011-822
R513	RESISTOR, FIXED, COMPOSITION: 1000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1025	10011-102
R514	Not used		
R515	Same as R513		
R516	Not used		
R517	Same as R513		
R518	Same as R513		
R519	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5 %; 1/4 w	Allen Bradley CB-1035	11693-103
R520	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1035	10011-103
R521	Same as R520		
R522	RESISTOR, FIXED, COMPOSITION: 1500 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1525	10011-152
R523	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1235	10011-123
R524	RESISTOR, FIXED, COMPOSITION: 330 ohms; ± 5 %; 1/4 w	Allen Bradley CB-3315	11693-331
R525	RESISTOR, FIXED, COMPOSITION: 270 ohms; ± 5 %; 1/4 w	Allen Bradley CB-2715	11693-271
V501	TUBE, ELECTRON: pentode	Amperex 6688	6688
V502	Same as V501		
V503	TUBE, ELECTRON: dual-triode	GE 6201/12 AT7WA	6201/12 AT7WA
V504	TUBE, ELECTRON: pentode	RCA 5725	5725
XV501	SOCKET, ELECTRON TUBE: 9 pin; mica filled	H. H. Eby TS103P01-169BC	11706
XV502	Same as XV501		
XV503	Same as XV501		
XV504	SOCKET, ELECTRON TUBE: 7 pin; mica filled	H. H. Eby TS162P01-235BC	11707
Y501	CRYSTAL Unit, QUARTZ: 73.3333 Mc; crystal	Monitor Prod. MC-18A	11709

AFC CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C601	CAPACITOR, FIXED, CERAMIC: feed thru type; 1000 pf	Allen Bradley FB2B-102	11684
C602	Same as C601		
C603	Same as C601		
C604	CAPACITOR, FIXED, CERAMIC: feed thru type; 10 pf; ± 20 %	Erie 362GP(SL)	10389
C605	Same as C604		
C606	Same as C601		
C607	Same as C601		
C608	Same as C601		
C609	CAPACITOR, FIXED, CERAMIC: standoff type; 1000 pf	Sprague 507-C-1000	10665
C610 thru C615	Same as C609		
C616	CAPACITOR, FIXED, CERAMIC: disc type; 2000 pf	Erie 801-0.022	10668
C617	Same as C616		
C618	Same as C616		
C619	Same as C616		
C620	CAPACITOR, FIXED, CERAMIC: 200 pf; ± 20 %	Erie GP2K-201	10667-201
C621	Same as C620		
C622	CAPACITOR, FIXED, CERAMIC: NPO type; 20 pf; 1000 vdcw	Sprague 10TCCQ20	11710
C623	Same as C622		
C624	CAPACITOR, FIXED, CERAMIC: disc type; 20,000 pf; 500 vdcw	Erie PZ5V	11767
C625	Same as C624		
C626	Same as C624		
C627	CAPACITOR, FIXED, CERAMIC: disc type; 10 pf; 1000 vdcw	Sprague 10TCCQ10	11698
C628	Same as C627		
C629	Same as C627		
C630	Same as C627		
CR601	SEMICONDUCTOR DEVICE, DIODE:	Fairchild FD100	11711
CR602	Same as CR601		
CR603	Same as CR601		
CR604	Same as CR601		
E601	SHIELD, ELECTRON TUBE: heat dissipating type; w/liner	Int. Elec. Research TR66015B	11340
E602	Same as E601		
E603	SHIELD, ELECTRON TUBE: heat dissipating type; w/liner	Int. Elec. Research TR66025B	11712
J601	CONNECTOR, PLUG: BNC type; straight shape	Amphenol UG-625/U	10723
L601	COIL, INTERMEDIATE FREQUENCY: tapped coil; adjustable	Stoddart 92277-3	92277-3
L602	COIL, INTERMEDIATE FREQUENCY: adjustable	Stoddart 92277-6	92277-6
L603	Same as L602		
L604	COIL, INTERMEDIATE FREQUENCY: adjustable	Stoddart 92285-10	92285-10
L605	COIL, INTERMEDIATE FREQUENCY: tapped coil; adjustable	Stoddart 92277-4	92277-4
L606	COIL, INTERMEDIATE FREQUENCY: adjustable	Stoddart 92277-5	92277-5
L607	COIL, RADIO FREQUENCY: 0.22 µh, choke coil	Delevan Elec. 1840-02	11702
L608	Same as L607		
L609	Same as L607		
L610	Same as L607		
L611	Same as L607		
L612	COIL, RADIO FREQUENCY: 1.2 µh, choke coil	Delevan Elec. 2890-00	11703
L613	Same as L612		
L614	COIL, RADIO FREQUENCY: 5.6 µh, choke coil	Delevan Elec. 2150-18	11704
L615	Same as L614		
L616	Same as L614		
L617	Same as L614		
P601	CONNECTOR, PLUG: BNC type; male contact	Amphenol UG-88c/u	11455
R601	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1005	10011-100
R602	Same as R601		
R603	Same as R601		
R604	Same as R601		
R605	RESISTOR, FIXED, COMPOSITION: 22 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2205	10011-220
R606	Same as R605		
R607	RESISTOR, FIXED, COMPOSITION: 56 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5605	10011-560
R608	Same as R607		
R609	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ± 5 %; 1/2 w	Allen Bradley EB-3925	10011-392
R610	RESISTOR, FIXED, COMPOSITION: 9100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-9125	10011-912
R611	Same as R610		
R612	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1015	10011-101
R613	Same as R612		
R614	Same as R612		
R615	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1235	10011-123
R616	RESISTOR, FIXED, COMPOSITION: 18,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1835	10011-183
R617	RESISTOR, FIXED, COMPOSITION: 330 ohms; ± 5 %; 1/2 w	Allen Bradley EB-3315	10011-331
R618	RESISTOR, FIXED, COMPOSITION: 1500 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1525	10011-152
R619	Same as R601		
R620	Same as R601		
R621	Same as R601		
R622	Same as R601		
V601	TUBE, ELECTRON: pentode	Raytheon 6688	6688
V602	Same as V601		
V603	ELECTRON TUBE:	Amperex 6686	6686
XV601	SOCKET, ELECTRON TUBE: 9 pin; mica filled	H. H. Eby TS103P01-169BC	11706
XV602	Same as XV601		
XV603	Same as XV601		

POWER SUPPLY

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
B701	FAN, VANEAXIAL:	Globe Industries C19A-524	18177
B702	Same as B701		
C701	CAPACITOR, FIXED, ELECTROLYTIC: 33 mfd; ± 20 %; 10 vdcw	Sprague Elec. 150D336X 0010B2	11825
C702	Same as C701		
C703	CAPACITOR, FIXED, ELECTROLYTIC: 150 mfd; ± 20 %; 6 vdcw	Sprague Elec. 150D157X 006R2	11826
C704	CAPACITOR, FIXED, ELECTROLYTIC: 220 mfd; ± 20 %; 10 vdcw	Sprague Elec. 150D227X 0010S2	11827
C705 thru C750	Not used		
C751	CAPACITOR, FIXED, PAPER: mylar dielectric; 100,000 mmf; ± 10 %; 200 vdcw	Sangamo Elec. 33M0201	11811
C752	CAPACITOR, FIXED, PAPER: mylar dielectric; epoxy dipped; 50,000 mmf; 200 vdcw	Sprague Elec. 2PS-S50	11926
C753	CAPACITOR, FIXED, ELECTROLYTIC: 30 mfd; 250 vdcw	Cornell-Dubilier BR-3025	11927
C754	Same as C753		
C755 thru C770	Not used		
C771	CAPACITOR, FIXED, ELECTROLYTIC: 4000 mfd; -10 % +100 %; 50 vdcw	Sangamo DCM-539-2741-01	18181
C772	Same as C771		
C773	CAPACITOR, FIXED, PAPER: mylar dielectric; 250,000 mmf; ± 20 %; 200 vdcw	Sprague type 2TMP25	11948
C774 thru C800	Not used		
C801	CAPACITOR, FIXED, ELECTROLYTIC: 500 mfd; 50 vdcw; 85°C operating temperature	Sprague TVA1315	11882
C802	CAPACITOR, FIXED, ELECTROLYTIC: 10 mfd; 25 vdcw; -20°C to +85°C working temp range	Sprague TE1204	11881
C803	Same as C802		
C804	CAPACITOR, FIXED, PAPER: metallized mylar; 2 mfd; 600 vdcw	Electron Prod. D-130	11880
C805	Same as C804		
C806	Not used		
C807	Same as C804		
C808	Same as C804		
C809	Same as C804		
C810	Same as C804		
C811	Not used		
C812	CAPACITOR, FIXED, PAPER: metallized mylar; 1.0 mfd; 1,000 vdcw	Electron Prod. D-130	11879
C813	Same as C812		
C814	Same as C812		
C815	Same as C812		
C816	Not used		
C817	Same as C812		
C818	Same as C812		
C819	CAPACITOR, FIXED, PAPER: metallized mylar; 5,000 mmf; 2,000 vdcw	Electron Prod. BW-150	11890

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C820	Not used		
C821	CAPACITOR, FIXED, ELECTROLYTIC: 2,000 mfd; 25 vdcw; -40°C to +85°C; temp range	P. R. Mallory HC2520A	11883
C822	CAPACITOR, FIXED, ELECTROLYTIC: 9,000 mfd; 50 vdcw; -20°C to +85°C temp. range	Aerovox Corp. QE50D	11933
C823	Same as C773		
C824 thru C900	Not used		
C901	CAPACITOR, FIXED, ELECTROLYTIC: 150 mfd; 450 vdcw; -40°C to +85°C	Sangamo DCM-539-2596-01	18179
C902	CAPACITOR, FIXED, ELECTROLYTIC: .05µfd; -10 % +50 % tol; 200 vdcw	Sprague 2PS-S50	11926
C903	CAPACITOR, FIXED, PAPER: 30µfd; -55°C to +125°C temp range; 450 vdcw	Sprague TVA1711	18187
C904	CAPACITOR, FIXED, PAPER: .02µfd; -55°C to +125°C temp range; 600 vdcw	Pyramid Electric CP25A1-EF203K	18173
C1601	CAPACITOR, FIXED, PLASTIC: 5µf; 200 vdcw	Electron Products M2-505-6350	18174
C1602	Same as C1601		
C1603	CAPACITOR, FIXED, CERAMIC: 0.1µf; ± 20 %; 500 vdcw	Sprague 5GAB-P10	12035
CR701	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N1692	1N1692
CR702	Same as CR701		
CR703	SEMICONDUCTOR DEVICE, DIODE: zener	Texas Inst. 1N751	1N751
CR704	SEMICONDUCTOR DEVICE, DIODE: zener	Motorola 1N2977B	1N2977B
CR705 thru CR750	Not used		
CR751	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N2484/F6	1N2484/F6
CR752	Same as CR751		
CR753	SEMICONDUCTOR DEVICE, DIODE: zener	Motorola 10M70ZB2	10M70ZB2
CR754	Same as CR753		
CR755	SEMICONDUCTOR DEVICE, DIODE: zener	Hoffman 1N1367	1N1367
CR756 thru CR770	Not used		
CR771	SEMICONDUCTOR DEVICE, DIODE:	Motorola 1N3209	1N3209
CR801	SEMICONDUCTOR DEVICE, DIODE: zener	Motorola 1N2970	1N2970
CR802	SEMICONDUCTOR DEVICE, DIODE: zener	Motorola 1N2977B	1N2977B
CR803	SEMICONDUCTOR DEVICE, DIODE: zener	Motorola 1N2621A	1N2621A
CR804	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N816	1N816
CR805	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N609	1N609
CR806	Not used		
CR807	SEMICONDUCTOR DEVICE, DIODE:	Motorola 1N3286	1N3286
CR808	Same as CR807		
CR809	Same as CR807		
CR810	Same as CR807		
CR811	Not used		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
CR812	SEMICONDUCTOR DEVICE, DIODE:	Motorola 1N3284	1N3284
CR813	Same as CR812		
CR814	Same as CR812		
CR815	Same as CR812		
CR816	Not used		
CR817	SEMICONDUCTOR DEVICE, DIODE:	Motorola 1N3209	1N3209
CR818	Same as CR817		
CR819	Same as CR817		
CR820	Not used		
CR821	Same as CR817		
CR822	SEMICONDUCTOR DEVICE, DIODE:	Motorola 1N1692	1N1692
CR823	Same as CR822		
CR824 thru CR910	Not used		
CR911	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N2484	1N2484
CR912	Same as CR911		
CR913	Same as CR911		
CR914	Same as CR911		
CR1601	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N2484	1N2484
CR1602	Same as CR1601		
F1501	FUSE CARTRIDGE: 8 amp, slo blo	Littlefuse 3AB-314008	12008
F1502	Same as F1501		
F1503	FUSE CARTRIDGE: 3/4 amp, 250 v, one time	Littlefuse 3 AG	10032
F1504	FUSE CARTRIDGE: 10 amp, 125 v	Littlefuse 313-010	11263-10
F1505	Same as F1504		
F1506	FUSE CARTRIDGE: 1/8 amp, 250 v, fast blow	Littlefuse 312-125	12011-1
F1507	FUSE CARTRIDGE: 4 amp, 250 v, fast blow	Littlefuse 312-04	12011-3
J792	CONNECTOR, RECEPTACLE: 26 contacts; 7.5 amps; 660 vac	Winchester MRE-26SG	11959-2
K791	RELAY, THERMAL: 60 seconds, 26.5 v	G. V. Controls Reline 6A15	11955
K792	RELAY, ARMATURE: 4.5 ma; dpdt	Sigma 42R06-10000G-Sil	11956
K793	RELAY, ARMATURE: dpdt; 110 vdc coil	Potter and Brumfield KRP11DG	18280
K794 thru K800	Not used		
K801	RELAY, ARMATURE: 4 pole, double throw; 24 vdcw	Potter and Brumfield KHP17D11	11891
L801	CHOKE, RADIO FREQUENCY: 200 mh; 1-5/16 in. dia by 23/32 in. high	Triad Trans. EC-200A	11884
L802	Same as L801		
L803	Same as L801		
LS1601	LOUDSPEAKER: permanent magnet, 5 by 7 in. oval	Cletron PM57FC	11859
P791	CONNECTOR, PLUG: 10 contacts; 4,000 vac	Winchester Elect. SA-10PG	11960
Q701	TRANSISTOR: silicon; npn	GE type 2N336	2N336
Q702	TRANSISTOR: silicon; pnp	Texas Inst. type 2N119	2N119
Q703	TRANSISTOR: germanium; pnp	Sylvania 2N213	2N213
Q704	TRANSISTOR: germanium; pnp	Sylvania type 2N1218	2N1218
Q705	Same as Q704		
Q706	Not used		
Q707	TRANSISTOR: germanium; pnp	Motorola 2N2152A	2N2152A
Q708	Same as Q707		
Q709 thru Q750	Not used		
Q751	TRANSISTOR: silicon; npn	Bendix-type 2N1136B	2N1136B
Q752 thru Q800	Not used		
Q801	TRANSISTOR: germanium; pnp	Motorola type 2N173	2N173
Q802	Same as Q801		
Q803	TRANSISTOR: silicon; npn	Bendix Corp. type 2N1136A	2N1136A
Q804	TRANSISTOR: germanium; npn	Sylvania type 2N1008A	2N1008A
Q805	TRANSISTOR: germainum; power transistor	Motorola 2N1099	2N1099
Q806	Not used		
Q807	Same as Q805		
Q808 thru Q900	Not used		
Q901	TRANSISTOR: equivalent of type 2N1073B except, equipped with terminal pins	Bendix Corp. type S215 No. B-1254	S215
Q902	Same as Q901		
Q903	Same as Q901		
Q904	Same as Q751		
Q905	TRANSISTOR: germanium; pnp	Sylvania type 2N1008	2N1008
Q906	Not used		
Q907	TRANSISTOR: germanium; npn	G. E. type 2N1086	2N1086
Q908	TRANSISTOR: germanium; npn	R. C. A. type 2N274	2N274
Q909	Same as Q908		
R701	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5%; 1/2 w	Allen Bradley EB-1015	10011-101
R702	Same as R701		
R703	RESISTOR, FIXED, COMPOSITION: 560 ohms; ± 5%; 1/2 w	Allen Bradley EB-5615	10011-561
R704	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1235	10011-123
R705	Same as R703		
R706	Not used		
R707	Same as R703		
R708	Same as R701		
R709	RESISTOR, FIXED, COMPOSITION: 1000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1025	10011-102
R710	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ± 5%; 1/2 w	Allen Bradley EB-3925	10011-392
R711	Not used		
R712	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1035	10011-103
R713	RESISTOR, FIXED, COMPOSITION: 51,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-5135	10011-513

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R714	RESISTOR, FIXED: wirewound; 5 ohms; 25 w	Daleohm type RH-25	11816
R715	RESISTOR, FIXED, COMPOSITION: 47 ohms; ± 5%; 2 w	Allen Bradley HB-4705	10377-470
R716	Not used		
R717	Same as R701		
R718	RESISTOR, FIXED, COMPOSITION: 47,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-4735	10011-473
R719	Same as R718		
R720	RESISTOR, FIXED, COMPOSITION: 5600 ohms; ± 5%; 1/2 w	Allen Bradley EB-5625	10011-562
R721	Not used		
R722	RESISTOR, FIXED, COMPOSITION: 18,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1835	10011-183
R723	Same as R704		
R724	Same as R709		
R725	Same as R720		
R726	Not used		
R727	RESISTOR, FIXED, COMPOSITION: 120 ohms; ± 5%; 1/2 w	Allen Bradley EB-1215	10011-121
R728	RESISTOR, FIXED, COMPOSITION: 56 ohms; ± 5%; 1/2 w	Allen Bradley EB-5605	10011-560
R729	Same as R709		
R730	Same as R709		
R731	Not used		
R732	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5%; 2 w	Allen Bradley HB-1005	10377-100
R733	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5%; 2 w	Allen Bradley HB-1015	10377-101
R734	RESISTOR, FIXED, COMPOSITION: 470 ohms; ± 5%; 1/2 w	Allen Bradley EB-4715	10011-471
R735	RESISTOR, FIXED, COMPOSITION: 22,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-2235	10011-223
R736	Not used		
R737	RESISTOR, VARIABLE: composition; 100 ohms; ± 10%; 1/2 w	Ohmite 3601	11817
R738	RESISTOR, VARIABLE: composition; 250 ohms ± 10%; 1/2 w	Ohmite 3602	11818
R739	Same as R737		
R740	Same as R701		
R741 thru R750	Not used		
R751	Same as R715		
R752	RESISTOR, VARIABLE: wirewound; 1000 ohms; ± 10%; 10 w	Ward Leonard type 10 A	11809
R753	RESISTOR, FIXED, COMPOSITION: 3000 ohms; ± 5%; 2 w	Allen Bradley HB-3025	10377-302
R754	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1045	10011-104
R755 thru R790	Not used		
R791	RESISTOR, FIXED, COMPOSITION: 30,000 ohms; ± 5%; 2 w	Allen Bradley HB-3035	10377-303

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R801	RESISTOR, FIXED, COMPOSITION: 33 ohms; ± 5%; 2 w	Allen Bradley HB-3305	10377-330
R802	RESISTOR, FIXED, COMPOSITION: 82 ohms; ± 5%; 2 w	Allen Bradley HB-8205	10377-820
R803	RESISTOR, FIXED, COMPOSITION: 1200 ohms; ± 5%; 1 w	Allen Bradley GB-1225	10012-122
R804	RESISTOR, FIXED, COMPOSITION: 330 ohms; ± 5%; 1 w	Allen Bradley GB-3315	10012-331
R805	RESISTOR, FIXED, COMPOSITION: 47 ohms; ± 5%; 2 w	Allen Bradley HB-4705	10377-470
R806	Not used		
R807	Same as R805		
R808	RESISTOR, FIXED: wirewound; 40 ohms; 5 w; non-inductive wound	Sprague type 453 E	11888-1
R809	Same as R808		
R810	RESISTOR, FIXED: wirewound; 10 ohms; 5 w; non-inductive wound	Sprague type 453 E	11888-2
R811	Not used		
R812	Same as R810		
R813	Same as R810		
R814	RESISTOR, FIXED, COMPOSITION: 2200 ohms; ± 5%; 1 w	Allen Bradley GB-2225	10012-222
R815	RESISTOR, FIXED, COMPOSITION: 2,200,000 ohms; ± 5%; 1 w	Allen Bradley GB-2255	10012-225
R816	Not used		
R817	Same as R815		
R818	Same as R815		
R819	Same as R815		
R820	Same as R815		
R821	Not used		
R822	Same as R815		
R823	RESISTOR, FIXED, COMPOSITION: 1,000,000 ohms; ± 5%; 1 w	Allen Bradley GB-1055	10012-105
R824	RESISTOR, FIXED: wirewound; 250 ohms ± 5%; 10 w	Sprague type 456 E	11885
R825	RESISTOR, VARIABLE: wirewound; 100 ohms; ± 10%; 2 w	Clarostat series 43	10473
R826	RESISTOR, VARIABLE: wirewound; 1 ohm; 25 w	Ohmite type 0360	11949
R827 thru R900	Not used		
R901	RESISTOR, FIXED, COMPOSITION: 470 ohms; ± 5%; 1/2 w	Allen Bradley EB-4715	10011-471
R902	RESISTOR, FIXED, COMPOSITION: 33 ohms; ± 5%; 1/2 w	Allen Bradley EB-3305	10011-330
R903	Same as R901		
R904	Same as R902		
R905	Same as R901		
R906	Same as R902		
R907	Same as R901		
R908	Same as R902		
R909	Same as R901		
R910	Same as R902		
R911	Same as R901		
R912	Same as R902		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R913	RESISTOR, FIXED, COMPOSITION: 82,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-8235	10011-823
R914	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; ± 5%; 1 w	Allen Bradley GB-3335	10012-333
R915	Not used		
R916	RESISTOR, VARIABLE: composition; 10,000 ohms; ± 10%; 2 w	Allen Bradley JLU-1031-SD-4040L	10379-103
R917	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1045	10011-104
R918	RESISTOR, FIXED, COMPOSITION: 68,000 ohms; ± 5%; 2 w	Allen Bradley HB-6835	10377-683
R919	RESISTOR, FIXED, COMPOSITION: 6800 ohms; ± 5%; 2 w	Allen Bradley HB-6825	10377-682
R920	RESISTOR, FIXED, COMPOSITION: 91,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-9135	10011-913
R921 thru R933	Not used		
R934	RESISTOR, FIXED: wirewound; 10 ohms; ± 5%; 10 w	Sprague 456 E	11950
R935	RESISTOR, FIXED, COMPOSITION: 220,000 ohms; ± 5%; 1 w	Allen Bradley GB-2245	10012-224
R1601	RESISTOR, FIXED, COMPOSITION: 8200 ohms; ± 5%; 2 w	Allen Bradley HB-8225	10377-822
R1602	RESISTOR, FIXED, COMPOSITION: 470,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-4745	10011-474
R1603	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ± 5%; 1 w	Allen Bradley GB-3925	10012-392

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
RT701	RESISTOR, THERMAL: thermistor; 1,000 ohms	GE D203	11824
S1601	SWITCH, ROTARY: 2 deck; 2 pos.	Stoddart 18183	18183
T701	TRANSFORMER, POWER, STEPDOWN: 6.3 v; filament supply	Stoddart 18182	18182
T702	TRANSFORMER, POWER, STEPDOWN: 6.3 v filament supply	Stoddart 11932	11932
T703 thru T770	Not used		
T771	TRANSFORMER, POWER, STEPDOWN: 28 v supply	Stoddart 11931	11931
T772 thru T800	Not used		-
T801	TRANSFORMER, POWER, STEPDOWN: 20 v supply	Stoddart 11688	11688
T802	TRANSFORMER, STEP-UP: hi-voltage transformer	Rytron T1045	11924
T803 thru T900	Not used		
T901	TRANSFORMER, POWER, STEPDOWN: 200 v supply	Stoddart 18178	18178
V701	ELECTRON TUBE: voltage regulator	RCA type GBOB2WA	GBOB2WA
V901	ELECTRON TUBE: dual-triode	RCA 6080	6080
V902	Same as V901		
V903	Same as V901		
V904	ELECTRON TUBE: pentode	RCA 6AU6	6AU6
V905	ELECTRON TUBE: voltage regulator	RCA OB2	OB2

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C1001	CAPACITOR, FIXED, CERAMIC: feedthru type; 1,000 mmf	Allen Bradley FB2B-102W	11684
C1002 thru C1015	Same as C1001		
C1016	CAPACITOR, FIXED, CERAMIC: 20 mmf; NPO; 1,000 vdcw	Sprague 10TCCQ 20NP0	11710
C1017 thru C1030	Same as C1001		
C1031	CAPACITOR, FIXED, CERAMIC: 3 mmf; ± 0.25 mmf tolerance	Erie Resistor CC21LJ030C	10440
C1032	CAPACITOR, FIXED, CERAMIC: 1,000 mmf; standoff type	Sprague 50T-C-1000	10665
C1033 thru C1049	Same as C1032		
C1050	CAPACITOR, FIXED, CERAMIC: 100,000 mmf; ± 200 %; 100 vdcw	Aerovox CR90V 104AM	11928
C1051	CAPACITOR, FIXED, CERAMIC: 10 mmf; 1000 vdcw; disc type	Sprague 10TCCQ10, NPO	11698
C1052	Not used		
C1053	CAPACITOR, VARIABLE, GLASS DIELECTRIC: 0.5 to 5.0 mmf; trimmer type	JFD Electric VC5	11697
C1054 thru C1057	Same as C1053		
C1058	CAPACITOR, FIXED, CERAMIC: 2,000 mmf; +100 % -0 %; 500 vdcw	Erie Resistor 801-0.002	10668
C1059 thru C1065	Same as C1058		
C1066	CAPACITOR, FIXED, CERAMIC: 1.0 mmf; ± 0.25 %; 600 vdcw	Erie TCO-1	12006
C1067 thru C1078	Same as C1058		
C1079	CAPACITOR, FIXED, CERAMIC: 6.8 mmf; NPO; 1,000 vdcw	Sprague Electric 10TCC-V68	11696
C1080	Not used		
C1081	CAPACITOR, FIXED, CERAMIC: 3.3 mmf; NPO; 1,000 vdcw	Sprague Electric 10TCC-V33	11700
C1082	Same as C1081		
C1083	Not used		
C1084	Same as C1058		
C1085	Same as C1058		
C1086	CAPACITOR, FIXED, CERAMIC: 2.2 mfd; 1,000 vdcw	Sprague Electric 10TCC-V22	12050
C1087	Same as C1058		
C1088	Same as C1058		
C1089	Same as C1032		
C1090	Same as C1032		
CR1001	SEMICONDUCTOR DEVICE, DIODE: zener diode;	Texas Inst. 1N752	iN752
CR1002	Same as CR1001		
CR1003	SEMICONDUCTOR DEVICE, DIODE: zener diode	Intl. Rect. type 1N1513	1N1513
E1001	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elect. Research TR5-5020B	11341
E1002	Same as E1001		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
E1003	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elect. Research TR6-6020B	11340
E1004	Same as E1003		
E1005	Same as E1003		
E1006	Same as E1003		
E1007	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elect. Research TR6-6025B	11943
E1008	Same as E1007		
E1009	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elect. Research TR5-5015B	11343
E1010	SHIELD, ELECTRON TUBE: heat dissipating type	Int. Elect. Research TR6-6020B	11339
E1011	Same as E1009		
J1001	CONNECTOR, RECEPTACLE: BNC type straight shape	Amphenol UG-625/u	10723
J1002	Same as J1001		
J1003	Same as J1001		
L1001	COIL, INTERMEDIATE FREQUENCY: 60 Mc coil; tuned	Stoddart 92277-4	92277-4
L1002	COIL, INTERMEDIATE FREQUENCY: 63.5 Mc coil; tuned	Stoddart 92278-9	92278-9
L1003	COIL, INTERMEDIATE FREQUENCY: 56 Mc coil; tuned	Stoddart 92278-10	92278-10
L1004	COIL, INTERMEDIATE FREQUENCY: 60 Mc coil; tuned	Stoddart 92278-8	92278-8
L1005	COIL, INTERMEDIATE FREQUENCY: 60 Mc coil; tuned	Stoddart 92277-5	92277-5
L1006	COIL, RADIO FREQUENCY: 1.2 μh; choke coil	Delevan Electric 2890-00	11703
L1007	Same as L1006		
L1008	Same as L1006		
L1009	Same as L1006		
L1010	Same as L1006		
L1011	Not used		
L1012	Same as L1006		
L1013	Same as L1006		
L1014	Same as L1006		
L1015	COIL, RADIO FREQUENCY: 0.22 μh; choke coil	Delevan Electric 1840-02	11702
L1016 thru L1025	Same as L1015		
L1026	COIL, RADIO FREQUENCY: 2.7 μh; choke coil	Delevan Electric 1840-16	11799
L1027 thru L1033	Same as L1026		
L1034	COIL, RADIO FREQUENCY: 5.6 μh; choke coil	Delevan Electric 2150-18	11704
L1035	COIL, RADIO FREQUENCY: 12.0 μh; choke coil	Jeffers Electric 10402-42	11800
L1036	COIL, RADIO FREQUENCY: 10.0 μh; choke coil	Stoddart 10360	10360
P1001	CONNECTOR, PLUG: male contact; BNC type	Amphenol UG-88 C/U	11455
P1002	Same as P1001		
P1003	Same as P1001		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1001	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5%; 1/4w	Allen Bradley CB-1005	11693-100
R1002 thru R1012	Same as R1001		
R1013	RESISTOR, FIXED, COMPOSITION: 27 ohms; ± 5%; 1/4w	Allen Bradley CB-2705	11693-270
R1014	Same as R1013		
R1015	Same as R1001		
R1016	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5%; 1/4w	Allen Bradley CB-1015	11693-101
R1017	RESISTOR, FIXED, COMPOSITION: 100 ohms; ± 5%; 1/2w	Allen Bradley EB-1015	10011-101
R1018	Same as R1016		
R1019	Same as R1017		
R1020	Same as R1016		
R1021	Same as R1017		
R1022	Same as R1016		
R1023	Same as R1016		
R1024	Same as R1016		
R1025	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; ± 5%; 1/2w	Allen Bradley EB-1535	10011-153
R1026	RESISTOR, FIXED, COMPOSITION: 20,000 ohms; ± 5%; 1/2w	Allen Bradley EB-2035	10011-203
R1027	RESISTOR, FIXED, COMPOSITION: 4700 ohms; ± 5%; 1/4w	Allen Bradley CB-4725	11693-472
R1028	Same as R1027		
R1029	Same as R1027		
R1030	RESISTOR, FIXED, COMPOSITION: 390 ohms; ± 5%; 1/4w	Allen Bradley CB-3915	11693-391
R1031	RESISTOR, FIXED, COMPOSITION: 1500 ohms; ± 5%; 1/2w	Allen Bradley EB-1525	10011-152
R1032	Same as R1031		
R1033	Same as R1031		
R1034	Same as R1001		
R1035	RESISTOR, FIXED, COMPOSITION: 9100 ohms; ± 5%; 1/2w	Allen Bradley EB-9125	10011-912
R1036	Same as R1035		
R1037	Same as R1035		
R1038	Same as R1035		
R1039	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1/2w	Allen Bradley EB-1035	10011-103
R1040	RESISTOR, FIXED, COMPOSITION: 3300 ohms; ± 5%; 1/2w	Allen Bradley EB-3325	10011-332
R1041	RESISTOR, FIXED, COMPOSITION: 8200 ohms; ± 5%; 2w	Allen Bradley HB-8225	10377-822
R1042	Not used		
R1043	RESISTOR, FIXED, COMPOSITION: 3300 ohms; ± 5%; 1/4w	Allen Bradley CB-3325	11693-332
R1044	Same as R1043		
R1045	RESISTOR, FIXED, COMPOSITION: 2200 ohms; ± 5%; 1/4w	Allen Bradley CB-2225	11693-222
R1046	Same as R1045		
R1047	Same as R1045		
R1048	RESISTOR, FIXED COMPOSITION: 120,000 ohms; ± 5%; 1/2w	Allen Bradley EB-1245	10011-124
R1049	Same as R1048		
R1050	RESISTOR, FIXED, COMPOSITION: 75 ohms; ± 5%; 1/2w	Allen Bradley EB-7505	10011-750
R1051	Same as R1050		
R1052	RESISTOR, FIXED, COMPOSITION: 680 ohms; ± 5%; 1/4w	Allen Bradley CB-6815	11693-681
R1053	Same as R1052		
R1054	RESISTOR, FIXED, COMPOSITION: 2400 ohms; ± 5%; 1/2w	Allen Bradley EB-2425	10011-242
R1055	RESISTOR, FIXED, COMPOSITION: 2700 ohms; ± 5%; 1/2w	Allen Bradley EB-2725	10011-272
R1056	RESISTOR, FIXED, COMPOSITION: 22 ohms; ± 5%; 1/2w	Allen Bradley EB-2205	10011-220
R1057	RESISTOR, FIXED, COMPOSITION: 5100 ohms; ± 5%; 1/4w	Allen Bradley CB-5125	11693-512
R1058	Same as R1026		
R1059	RESISTOR, FIXED, COMPOSITION: 47 ohms; ± 5%; 1/4w	Allen Bradley CB-4705	11693-470
R1060	RESISTOR, FIXED, COMPOSITION: 470,000 ohms; ± 5%; 1/4w	Allen Bradley CB-4745	11693-474
R1061	RESISTOR, FIXED, COMPOSITION: 2,200,000 ohms; ± 5%; 1/4 w	Allen Bradley CB-2255	11693-225
R1062	RESISTOR, FIXED, COMPOSITION: 5,600,000 ohms; ± 5%; 1/4 w	Allen Bradley CB-5655	11693-565
R1063	RESISTOR, FIXED, COMPOSITION: 1,000,000 ohms; ± 5% 1/4 w	Allen Bradley CB-1055	11693-105
R1064	RESISTOR, FIXED, COMPOSITION: 1200 ohms; ± 5%; 1w	Allen Bradley GB-1225	10012-122
R1065	Not used		
R1066	Same as R1040		
R1067	RESISTOR, FIXED, COMPOSITION: 1000 ohms; ± 5%; 1/2w	Allen Bradley EB-1025	10011-102
R1068	Same as R1039		
R1069	Same as R1016		
R1070	RESISTOR, FIXED, COMPOSITION: 56 ohms; ± 5%; 1/4w	Allen Bradley CB-5605	11693-560
R1071	Same as R1001		
R1072	Same as R1001		
RT1001	RESISTOR, THERMAL:	Victory Eng. 21E2	11701
T1001	TRANSFORMER, INTERMEDIATE FREQUENCY:	Stoddart 92268-1	92268-1
T1002	Same as T1001		
T1003	Same as T1001		
T1004	TRANSFORMER, INTERMEDIATE FREQUENCY:	Stoddart 92276-1	92276-1
T1005	TRANSFORMER, INTERMEDIATE FREQUENCY:	Stoddart 92268-2	92268-2
V1001	TUBE, ELECTRON: pentode	RCA 6AU6WB	6AU6WB
V1002	Same as V1001		
V1003	TUBE, ELECTRON: pentode	Amperex 6688	6688
V1004	Same as V1003		
V1005	Same as V1003		

MAIN I.F.

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
V1006	Same as V1003		
V1007	TUBE, ELECTRON: pentode	RCA 6677	6677
V1008	Same as V1007		
V1009	TUBE, ELECTRON: diode	RCA 5726	5726
V1010	TUBE, ELECTRON: dual-triode	RCA 5814	5814
V1011	TUBE, ELECTRON: tetrode	RCA 5654	5654
XV1001	SOCKET, ELECTRON TUBE: 7 pin, mica filled	H. H. Eby TS102P01-235BC	11707
XV1002	Same as XV1001		
XV1003	SOCKET, ELECTRON TUBE: 9 pin, mica filled	H. H. Eby TS103P01-169BC	11706
XV1004	Same as XV1003		
XV1005	Same as XV1003		
XV1006	Same as XV1003		
XV1007	SOCKET, ELECTRON: TUBE: 9 pin, bottom mtg	Cinch Mfg. 9EM	11705
XV1008	Same as XV1007		
XV1009	Same as XV1001		
XV1010	Same as XV1003		
XV1011	Same as XV1001		
XV1012	Same as XV1001		

METER CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C1101	CAPACITOR, FIXED, PAPER: 100,000 mmf; 200 vdcw	Aerovox P123ZN	11695
C1102	Not used		
C1103	CAPACITOR, FIXED, PAPER: 47,000 mmf; 100 vdcw	Aerovox P323S	11849
C1104	Same as C1103		
C1105	Not used		
C1106	Not used		
C1107	CAPACITOR, FIXED, PAPER: 3300 mmf; 300 vdcw	Aerovox P323S	11847
C1108	CAPACITOR, FIXED, PAPER: 1000 mmf; 300 vdcw	Sprague 91P10293S2	11964
C1109	CAPACITOR, FIXED, CERAMIC: disc type; 20,000 mmf; 500 vdcw	Erie PZ5V	11767
C1110	CAPACITOR, FIXED, CERAMIC: 1000 mmf; 1000 vdcw	Centralab DD-102	11140
C1111	Not used		
C1112	Same as C1109		
C1113	Same as C1109		
C1114	Same as C1109		
C1115	Same as C1109		
C1116	Not used		
C1117	CAPACITOR, FIXED, PAPER: 180,000 mmf; ± 5%; 300 vdcw	Electron Products W-125	11939
C1118	Same as C1117		
C1119	CAPACITOR, FIXED, ELECTROLYTIC: tantalum; 250 mf; 10 vdcw	Fansteel F304	11567
C1120	Not used		
C1121	Not used		
C1122	Same as C1109		
C1123	Same as C1109		
C1124	CAPACITOR, FIXED, ELECTROLYTIC: tantalum; 10 μf; 25 vdcw	Fansteel PP10B25A2	10459
C1125	CAPACITOR, FIXED, PAPER: 330,000 mmf; 300 vdcw	Electron Products M150	11857
C1126	Not used		
C1127	CAPACITOR, FIXED, CERAMIC: 0.1 μf; ± 20%; 500 vdcw	Sprague 5GAB-P10	12035
C1128	Not used		
C1129	Not used		
C1130	Same as C1109		
C1131	Same as C1110		
C1132	Same as C1110		
C1133	Same as C1109		
C1134	CAPACITOR, FIXED, CERAMIC: 2000 mmf; +100% -0%; 500 vdcw	Erie 801-0.002	10668
CR1101 and CR1102	Not used		
CR1103	SEMICONDUCTOR DEVICE, DIODE: zener	Motorola 1N975	1N975
CR1104	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N459	1N459
CR1105	Same as CR1104		
CR1106 thru CR1108	Not used		
CR1109	SEMICONDUCTOR DEVICE, DIODE:	CBS 1N498	1N498
CR1110	SEMICONDUCTOR DEVICE, DIODE: zener	Texas Inst. 1N3045	1N3045
CR1111	Not used		
CR1112	SEMICONDUCTOR DEVICE, DIODE: zener	Texas Inst. 1N3046	1N3046
CR1113	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N2071	1N2071
CR1114	Not used		
CR1115	Same as CR1104		
CR1116	Same as CR1104		
CR1117	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N2484	1N2484
E1101	SHIELD, ELECTRON TUBE: heat dissipating type, w/liner	Int. Elect. Research TR66020	11339
E1102	Same as E1101		
E1103	Same as E1101		
E1104	Same as E1101		
E1105	SHIELD, ELECTRON TUBE: heat dissipating type, w/liner	Int. Elect. Research TR55020	11341
E1106	Not used		
E1107	Same as E1105		
E1108	Same as E1101		
E1109	Same as E1101		
E1110	SHIELD, ELECTRON TUBE:	H. H. Eby TS102U02	10116
J1101	CONNECTOR, RECEPTACLE: BNC type; straight shape	Amphenol UG-625/U	10723
K1101	RELAY, ARMATURE: 4 pdt; 3 amp; 28 vdcw	Guardian Electric AN-3304-1	11863
K1102	Same as K1101		
K1103	RELAY, ARMATURE: spdt; 24 vdcw; 7 pin socket mtg.	Potter and Brumfield SM5LS	12034
L1101	COIL, RADIO FREQUENCY: 19 mh, choke coil	Stoddart 90825-1	90825-1

METER CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
P1101	CONNECTOR PLUG: BNC type; female contact	Amphenol UG-88C/U	11455
R1101	RESISTOR, FIXED, COMPOSITION: 1,000,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1055	10011-105
R1102	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1535	10011-153
R1103	Same as R1102		
R1104	RESISTOR, FIXED, COMPOSITION: 470,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-4745	10011-474
R1105	Same as R1104		
R1106	Not used		
R1107	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1035	10011-103
R1108	Same as R1107		
R1109	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1045	10011-104
R1110	Same as R1109		
R1111	Not used		
R1112	RESISTOR, FIXED, COMPOSITION: 2700 ohms; ± 5%; 1/2 w	Allen Bradley EB-2725	10011-272
R1113	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1235	10011-123
R1114	Same as R1109		
R1115	Same as R1101		
R1116	Not used		
R1117	Same as R1101		
R1118	Same as R1101		
R1119	Same as R1101		
R1120	Same as R1109		
R1121	Not used		
R1122	RESISTOR, FIXED, COMPOSITION: 200,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-2045	10011-204
R1123	Same as R1101		
R1124	RESISTOR, FIXED, COMPOSITION: 5600 ohms; ± 5%; 1/2 w	Allen Bradley EB-5625	10011-562
R1125	Same as R1101		
R1126	Not used		
R1127	Same as R1112		
R1128	RESISTOR, FIXED, COMPOSITION: 3,000,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-3055	10011-305
R1129	RESISTOR, FIXED, COMPOSITION: 18,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1835	10011-183
R1130	Same as R1129		
R1131	Not used		
R1132	Same as R1128		
R1133	RESISTOR, FIXED, COMPOSITION: 5,600,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-5655	10011-565
R1134	Not used		
R1135	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1 w	Allen Bradley GB-1035	10012-103
R1136	Not used		
R1137	Same as R1124		
R1138	Same as R1101		
R1139	Same as R1101		
R1140	RESISTOR, FIXED, COMPOSITION: 270 ohms; ± 5%; 1/2 w	Allen Bradley EB-2715	10011-271
R1141	Not used		
R1142	Same as R1133		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1143	Same as R1101		
R1144	RESISTOR, FIXED, COMPOSITION: 22,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-2235	10011-223
R1145	Same as R1144		
R1146	Not used		
R1147	RESISTOR, FIXED, COMPOSITION: 820 ohms; ± 5%; 1/2 w	Allen Bradley EB-8215	10011-821
R1148	Same as R1147		
R1149	Same as R1102		
R1150	Same as R1144		
R1151	Not used		
R1152	Not used		
R1153	RESISTOR, FIXED, COMPOSITION: 2200 ohms; ± 5%; 1/2 w	Allen Bradley EB-2225	10011-222
R1154	Same as R1153		
R1155	RESISTOR, FIXED, COMPOSITION: 680 ohms; ± 5%; 1/2 w	Allen Bradley EB-6815	10011-681
R1156	Not used		
R1157	RESISTOR, FIXED, COMPOSITION: 1,500,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1555	10011-155
R1158	RESISTOR, FIXED, COMPOSITION: 330,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-3345	10011-334
R1159	Same as R1102		
R1160	RESISTOR, FIXED, COMPOSITION: 220 ohms; ± 5%; 1/2 w	Allen Bradley EB-2215	10011-221
R1161	Same as R1101		
R1162	RESISTOR, FIXED, COMPOSITION: 2,200,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-2255	10011-225
R1163	RESISTOR, VARIABLE: composition; 500,000 ohms 0.2 w	Clarostat 48M9-500K	12005
R1164	Same as R1163		
R1165	RESISTOR, FIXED, COMPOSITION: 27,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-2735	10011-273
R1166	Same as R1101		
T1101	TRANSFORMER, RADIO FREQUENCY: interstage transformer	United Trans. Corp. 0-7	11862
T1102	Same as T1101		
T1103	TRANSFORMER, AUDIO FREQUENCY: 12 w output	United Trans. Corp. S-15	11861
V1101	TUBE, ELECTRON: dual-triode	RCA 5814A	5814A
V1102	Same as V1101		
V1103	Same as V1101		
V1104	Same as V1101		
V1105	TUBE, ELECTRON: triode	GE 6100WA	6100WA
V1106	Not used		
V1107	Same as V1105		
V1108	TUBE, ELECTRON: dual-triode	RCA 6201WA	6201WA
V1109	Same as V1101		
XK1101	SOCKET, RELAY: 7 pin; mica filled	H. H. Eby TS102C01	10118
XV1101	SOCKET, ELECTRON TUBE: 9 pin; mica filled bakelite	H. H. Eby TS103P01-169-BC	11706
XV1102	Same as XV1101		
XV1103	Same as XV1101		
XV1104	Same as XV1101		
XV1105	Same as XV1101		
XV1106	Not used		

METER CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
XV1107	Same as XV1101		
XV1108	SOCKET, ELECTRON TUBE: 7 pin mica filled bakelite	H. H. Eby TS102P01-235-BC	11707
XV1109	Same as XV1101		

VIDEO CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C1201	CAPACITOR, FIXED, ELECTROLYTIC: 15 mfd; -10% +150%; 50 vdcw	Cornell Dublier NLW15-50	11803
C1202	CAPACITOR, FIXED, PAPER: 100,000 mmf; ± 20%; 200 vdcw	Aerovox P123ZN	11695
C1203	Not used		
C1204	CAPACITOR, FIXED, CERAMIC: 20,000 mfd; 500 vdcw	Erie Resistor PZ5V	11767
C1205	Same as C1204		
C1206	CAPACITOR, FIXED, ELECTROLYTIC: 50 mfd; 50 vdcw	Cornell Dublier NLW40-50	12004
C1207	CAPACITOR, FIXED, CERAMIC: 200 mmf; ± 20%; 500 vdcw	Erie Resistor GP2K-201	10667-201
C1208	CAPACITOR, FIXED, PAPER: 2 mfd; 300 vdcw	San Fernando Electric 69K3205AAA	11897
C1209	Same as C1202		
C1210	Same as C1202		
C1211	Not used		
C1212	Same as C1202		
C1213	CAPACITOR, FIXED, CERAMIC: 20 mmf; disc type	Erie Resistor ED-20	11865
C1214	Same as C1204		
C1215	Same as C1202		
C1216	Not used		
C1217	CAPACITOR, FIXED, PAPER: 2 mfd; 200 vdcw	Electron Products M150-205	11828
C1218	Same as C1204		
C1219	Same as C1202		
C1220	CAPACITOR, FIXED, PAPER: 10,000 mmf; ± 10%; 100 vdcw	Aerovox P323S	11866
C1221	Not used		
C1222	Same as C1204		
C1223	Same as C1202		
C1224	CAPACITOR, FIXED, CERAMIC: 2,000 mmf; -0% +100%; 500 vdcw	Erie Resistor 801-0.022	10668
C1225	Same as C1202		
C1226	Not used		
C1227	Same as C1204		
C1228	CAPACITOR, FIXED, CERAMIC: 15 mmf; disc type	Erie Resistor ED-15	11867
C1229	Same as C1204		
C1230	CAPACITOR, FIXED, CERAMIC: 50 mmf; ± 10%; 500 vdcw	Erie Resistor U2M	11713
C1231	Not used		
C1232	Same as C1204		
C1233	CAPACITOR, FIXED, ELECTROLYTIC: tantalum; 1 mfd; 35 vdcw	P.R.Mallory TAS 1-35	11694
C1234	Same as C1204		
C1235	Same as C1204		
C1236	Not used		
C1237	Same as C1204		
C1238	Same as C1204		
C1239	CAPACITOR, FIXED, ELECTROLYTIC: 6 mfd; -40° to 85° C temt. range; 400 vdcw	MIL-C-62A CE64C060Q	11026
C1240	Same as C1204		
C1241	CAPACITOR, FIXED, PLASTIC: 0.33 mfd; 300 vdcw	Electron Products M150	11857
CR1201	SEMICONDUCTOR DEVICE, DIODE:	Fairchild FD-100	11711
CR1202	Same as CR1201		
CR1203	Same as CR1201		
CR1204	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N459	1N459
CR1205	Same as CR1201		
CR1206	Same as CR1201		
CR1207	Same as CR1201		
CR1208	Same as CR1201		
CR1209	SEMICONDUCTOR DEVICE, DIODE: zener	Texas Inst. 1N746	1N746
CR1210	SEMICONDUCTOR DEVICE, DIODE:	Texas Inst. 1N462	1N462
CR1211	Not used		
CR1212	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N2484/F6	1N2484/F6
CR1213	Same as CR1212		
DL1201	DELAY, LINE:	Valor 10C8-9/10	11870
DL1202	DELAY, LINE: 5.0 M sec.; 1,000 ohms	Valor DL-336	11869
E1201	SHIELD, ELECTRON TUBE: heat dissipating type; w/liner	Int. Elect. Research TR66020	11339
E1202	SHIELD, ELECTRON TUBE: heat dissipating type; w/liner	Int. Elect. Research TR66025B	11712
E1203	Same as E1202		
E1204	Same as E1201		
E1205	Same as E1201		
E1206	Not used		
E1207	Same as E1202		
E1208	Same as E1201		
E1209	Same as E1201		
J1201	CONNECTOR, RECEPTACLE: BNC type; straight shape	Amphenol UG-625/U	10723
J1202	CONNECTOR, RECEPTACLE:	Stoddart 12028	12028
L1201	COIL, RADIO FREQUENCY: 220 μh; choke coil	Delevan Electric 3500-16	11868
P1201	CONNECTOR, PLUG: p/o video cable	Amphenol UG-88C/U	11455
R1201	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1035	10011-103
R1202	RESISTOR, FIXED, COMPOSITION: 3300 ohms; ± 5%; 1/2 w	Allen Bradley EB-3325	10011-332
R1203	RESISTOR, FIXED, COMPOSITION: 2,200,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-2255	10011-225
R1204	RESISTOR, FIXED, COMPOSITION: 470,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-4745	10011-474

VIDEO CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1205	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1005	10011-100
R1206	Not used		
R1207	Same as R1202		
R1208	Same as R1201		
R1209	Same as R1201		
R1210	RESISTOR, FIXED, COMPOSITION: 12,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1235	10011-123
R1211	Not used		
R1212	RESISTOR, FIXED, COMPOSITION: 180,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1845	10011-184
R1213	RESISTOR, FIXED, COMPOSITION: 18,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1835	10011-183
R1214	RESISTOR, FIXED, COMPOSITION: 2200 ohms; ± 5 %; 2 w	Allen Bradley HB-2225	10377-222
R1215	RESISTOR, FIXED, COMPOSITION: 1,000,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1055	10011-105
R1216	Not used		
R1217	Same as R1214		
R1218	RESISTOR, FIXED, COMPOSITION: 270 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2715	10011-271
R1219	Same as R1210		
R1220	Same as R1210		
R1221	Not used		
R1222	RESISTOR, FIXED, COMPOSITION: 10,000,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1065	10011-106
R1223	RESISTOR, FIXED, COMPOSITION: 390 ohms; ± 5 %; 1/2 w	Allen Bradley EB-3915	10011-391
R1224	RESISTOR, FIXED, COMPOSITION: 1000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1025	10011-102
R1225	Same as R1205		
R1226	Not used		
R1227	Same as R1215		
R1228	RESISTOR, FIXED, COMPOSITION: 75 ohms; ± 5 %; 1/2 w	Allen Bradley EB-7505	10011-750
R1229	Same as R1201		
R1230	Same as R1228		
R1231	RESISTOR, FIXED, COMPOSITION: 5,600,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5655	10011-565
R1232	Same as R1215		
R1233	Same as R1224		
R1234	RESISTOR, FIXED, FILM: 20 megohm; ± 2 %; glass encapsulated	Victoreen RX-3	11872
R1235	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1045	10011-104
R1236	Same as R1213		
R1237	RESISTOR, FIXED, COMPOSITION: 4700 ohms; ± 5 %; 1/2 w	Allen Bradley EB-4725	10011-472
R1238	Same as R1224		
R1239	Same as R1201		
R1240	Same as R1235		
R1241	Not used		
R1242	Same as R1237		
R1243	RESISTOR, FIXED, COMPOSITION: 68,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-6835	10011-683
R1244	Same as R1218		
R1245	Same as R1243		
R1246	Not used		
R1247	Same as R1215		
R1248	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5 %; 2 w	Allen Bradley HB-1035	10377-103
R1249	Same as R1248		
R1250	Same as R1205		
R1251	Not used		
R1252	Same as R1201		
R1253	Same as R1210		
R1254	RESISTOR, FIXED, COMPOSITION: 470 ohms; ± 5 %; 1/2 w	Allen Bradley EB-4715	10011-471
R1255	RESISTOR, FIXED, COMPOSITION: 2200 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2225	10011-222
R1256	Not used		
R1257	Same as R1235		
R1258	Same as R1205		
R1259	Same as R1201		
R1260	RESISTOR, FIXED, COMPOSITION: 27,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2735	10011-273
R1261	Not used		
R1262	Same as R1235		
R1263	Same as R1204		
R1264	Same as R1235		
R1265	Same as R1201		
R1266	Not used		
R1267	RESISTOR, FIXED, COMPOSITION: 56,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5635	10011-563
R1268	Same as R1201		
R1269	Same as R1267		
R1270	Same as R1204		
R1271	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-3335	10011-333
R1272	RESISTOR, FIXED, COMPOSITION: 150,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1545	10011-154
V1201	TUBE, ELECTRON: dual-triode;	RCA 6201/12AT-7WA	6201/12AT-7WA
V1202	TUBE, ELECTRON: pentode	RCA 6677	6677
V1203	TUBE, ELECTRON: pentode	Amperex 6686	6686
V1204	TUBE, ELECTRON: dual-triode	RCA 5814A	5814A
V1205	Same as V1204		
V1206	Not used		
V1207	Same as V1203		
V1208	Same as V1204		
V1209	Same as V1204		
XV1201	SOCKET, ELECTRON TUBE: 9 pin mica filled bakelite	H. H. Eby TS103P01-169-BC	11706
XV1202	Same as XV1201		
XV1203	Same as XV1201		
XV1204	Same as XV1201		
XV1205	Same as XV1201		
XV1206	Not used		
XV1207	Same as XV1201		
XV1208	Same as XV1201		
XV1209	Same as XV1201		

CHOPPER CHASSIS

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C1301	CAPACITOR, FIXED, CERAMIC: 0.02 μf; 500 vdcw	Erie PZ5V	11767
C1302	CAPACITOR, FIXED, MICA: 330 $\mu\mu$f; ± 1%; 500 vdcw	Elmenco DM15-331F	11654-331
C1303	CAPACITOR, FIXED: 820 $\mu\mu$f; ± 5%; 300 vdcw	Elmenco DM15-821J	18172
C1304	CAPACITOR, FIXED, PAPER: 0.1 μf; 200 vdcw	Aerovox P123ZN	11695
CR1301	SEMICONDUCTOR DEVICE, DIODE: zener	Texas Inst. 1N746	1N746
CR1302	SEMICONDUCTOR DEVICE, DIODE: zener	Texas Inst. 1N752	1N752
CR1303	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N498	1N498
CR1304	SEMICONDUCTOR DEVICE, DIODE:	Sylvania 1N2484	1N2484
E1301	SHIELD, ELECTRON TUBE: aluminum shield with liner	Int. Elect. Research TR 66020	11339
E1302	Same as E1301		
E1303	Same as E1301		
J1301	Not used		
J1302	CONNECTOR RECEPTACLE: BNC type connector	MIL type UG-625/U	10723
J1303	Same as J1302		
J1304	CONNECTOR RECEPTACLE: microdot; series S-93	Microdot 31-52	12028
J1305	Same as J1302		
K1301	RELAY, ARMATURE: 4 PDT, 110 vdc	Potter and Brumfield KHP17D11 110 vdc	18166
P1301	CONNECTOR, PLUG: 8 pin; male contacts	Winchester Elec. MRE-8P	18164-2
Q1301	TRANSISTOR:	Texas Inst. 2N525	2N525
R1301	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 2 w	Allen Bradley HB-1035	10377-103
R1302	RESISTOR, FIXED, COMPOSITION: 5600 ohms; ± 5%; 1/2 w	Allen Bradley EB-5625	10011-562
R1303	RESISTOR, FIXED, COMPOSITION: 20,000 ohms; ± 5%; 1 w	Allen Bradley GB-2035	10012-203
R1304	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1 w	Allen Bradley GB-1035	10012-103
R1305	RESISTOR, FIXED, COMPOSITION: 33,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-3335	10011-333
R1306	RESISTOR, FIXED, COMPOSITION: 8200 ohms; ± 5%; 1/2 w	Allen Bradley EB-8225	10011-822
R1307	RESISTOR, FIXED, COMPOSITION: 47,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-4735	10011-473
R1308	RESISTOR, FIXED, COMPOSITION: 680,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-6845	10011-684
R1309	Same as R1307		
R1310	RESISTOR, FIXED, COMPOSITION: 330,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-3345	10011-334
R1311	Same as R1301		
R1312	RESISTOR, FIXED, COMPOSITION: 1000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1025	10011-102
R1313	Same as R1307		
R1314	Not used		
R1315	RESISTOR, VARIABLE: composition; 1000 ohms; ± 10%; 2 w	Allen Bradley	10141
R1316	Not used		
R1317	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5%; 1/2 w	Allen Bradley EB-1005	10011-100
R1318	Same as R1317		
R1319	Not used		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1320	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1045	10011-104
V1301	TUBE, ELECTRON: dual-triode	RCA 5814A	5814A
V1302	Same as V1301		
V1303	Same as V1301		

CONTROL CIRCUIT

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
AT1501	ATTENUATOR, FIXED: 0 db pad	Stoddart 92405-0	92405-0
AT1502	Same as AT1501		
AT1503	ATTENUATOR, FIXED: 20 db pad	Stoddart 92405-20	92405-20
AT1504	ATTENUATOR, FIXED: 40 db pad	Stoddart 92405-40	92405-40
AT1505	ATTENUATOR, FIXED: 60 db pad	Stoddart 92405-60	92405-60
AT1506	ATTENUATOR, VARIABLE: c/o two connectors J1505, J1506, 2 fixed and 1 variable resistors	Stoddart 92733-1	92733-1
C1501	CAPACITOR, FIXED, ELECTROLYTIC: 100 mfd; 30 vdcw	Sprague Electric 1320107C2030	12014
C1502	Same as C1501		
C1503	CAPACITOR, FIXED, CERAMIC: 2,000 mmf; - 0 %; +100 %; 500 vdcw	Erie Resistor Corp. 801-022	10668
C1504	CAPACITOR, FIXED, PAPER: 100,000 mmf; ± 5 %	San Fernando Elec. type No. Westcap MS4J104	11935
C1505	CAPACITOR, FIXED, ELECTROLYTIC: 5 mfd; -15 +15 %; 50 vdcw	Fansteel Met'll PPSB50A2	10677
C1506	Same as C1503		
C1507	CAPACITOR, FIXED, CERAMIC: 20,000 mmf; 500 vdcw	Erie Resistor Corp. PZ5V	11767
C1508	Same as C1507		
C1509	Same as C1504		
C1510	CAPACITOR, FIXED, PAPER: 2 mfd; ± 5 %	San Fernando Elect. Type No. Westcap WS4J205	11934
C1511	Same as C1510		
C1512	CAPACITOR, FIXED, PAPER: 250,000 mmf; ± 5 %	San Fernando Elec. type No. Westcap MS4J254	11936
C1513	CAPACITOR, FIXED, PAPER: 47,000 mmf; ± 5 %	San Fernando Elec. type No. Westcap MS4J473	11937
C1514	CAPACITOR, FIXED, PAPER: 10,000 mmf; ± 5 %	San Fernando Elec. type No. Westcap 43J2103	11938
C1515	Not used		
C1516	CAPACITOR, FIXED, PLASTIC: 5,000 mmf; 2,000 vdcw	Electron Products BW-150	11890
C1517	Same as C1516		
C1518	CAPACITOR, FIXED, PAPER: mylar dielectric; 50,000 mmf; 200 vdcw	Sprague Electric 2PS-S50	11926
C1519	Same as C1518		
C1520	Same as C1518		
C1521	CAPACITOR, FIXED CERAMIC: feedthru type; 1,000 mmf	Allen Bradley FB2B-102W	11684
C1522 thru C1542	Same as C1521		
C1543	CAPACITOR, FIXED, CERAMIC: 20,000 mmf; 500 vdcw; disc type	Erie Resistor Corp. type PZ5V	11767
C1544	Same as C1501		
C1545	Same as C1501		
CP1501	CONNECTOR, ADAPTER: type BNC; male adapter	Amphenol type UG491A/U	11895
CP1502	Same as CP1501		
CP1503	Same as CP1501		
CR1501	SEMICONDUCTOR DEVICE, DIODE: silicon rectifier	Sylvania	1N2484
CR1502	Same as CR1501		
CR1503	SEMICONDUCTOR DEVICE, DIODE: silicon rectifier	Texas Inst. type 620C	11195
CR1504	Same as CR1501		
CR1505	SEMICONDUCTOR DEVICE, DIODE: silicon rectifier	Fairchild type FD-100	11711
CR1506	Same as CR1501		
CR1507	Same as CR1501		
CR1508 thru CR1529	Not used		
CR1530	SEMICONDUCTOR DEVICE:	Texas Inst. 1N751A	1N751A
DS1501	CONNECTOR, LIGHT: indicator lamp, green	Dialco 81410-112	11973-2
DS1502	CONNECTOR, LIGHT: indicator lamp, red	Dialco 81410-111	11973-1
I1501	LAMP, GLOW: neon, indicator	GE - NE-48	10726
K1501	RELAY, ARMATURE: 4 pole, double throw; 24 vdcw	Potter and Brumfield KHP 17011	11891
K1502 thru K1509	Not used		
K1510	Same as K1501		
K1511	Same as K1501		
M1501	METER, FIELD STRENGTH: 0 to 100 micro-volt; 0 to 40 db scales	Weston Model 1756	11892
R1501	RESISTOR, VARIABLE: wirewound; 1,000 ohms; 25 w	Ohmite Mfg. model H, 0158	11965-102
R1502	RESISTOR, VARIABLE: wirewound; 50 ohms; 12.5 w	Ohmite Mfg. type E 0110	11970-500
R1503	RESISTOR, FIXED, COMPOSITION: 220,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2245	10011-224
R1504	Same as R1503		
R1505	Same as R1503		
R1506	Same as R1503		
R1507	RESISTOR, FIXED, COMPOSITION: 180 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1815	10011-181
R1508	Same as R1507		
R1509	Same as R1507		
R1510	Same as R1507		
R1511	RESISTOR, FIXED, COMPOSITION: 2200 ohms; ± 5 %; 1/2 w	Allen Bradley EB-2225	10011-222
R1512	Same as R1511		
R1513	Same as R1511		
R1514	Same as R1511		
R1515	RESISTOR, FIXED, COMPOSITION: 1200 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1225	10011-122
R1516	Same as R1515		
R1517	RESISTOR, FIXED, COMPOSITION: 1500 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1525	10011-152
R1518	Same as R1517		
R1519	RESISTOR, VARIABLE: composition; 10,000 ohms; ± 10 %; 2 w	Allen Bradley type J	10379-103
R1520	Not used		

CONTROL CIRCUIT

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1521	RESISTOR, FIXED, COMPOSITION: 300,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-3045	10011-304
R1522	RESISTOR, FIXED, COMPOSITION: 82,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-8235	10011-823
R1523	RESISTOR, FIXED, COMPOSITION: 5.6 megohm; ± 5%; 1/2 w	Allen Bradley EB-5655	10011-565
R1524	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1035	10011-103
R1525	Not used		
R1526	RESISTOR, FIXED, COMPOSITION: 1 megohm; ± 5%; 1/2 w	Allen Bradley EB-1055	10011-105
R1527	Same as R1526		
R1528	RESISTOR, FIXED, COMPOSITION: 68,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-6835	10011-683
R1529	RESISTOR, VARIABLE: composition; 10,000 ohms; ± 10%; 2 w	Allen Bradley type J	10408
R1530	RESISTOR, FIXED, COMPOSITION: 4,700 ohms; ± 5%; 1/2 w	Allen Bradley EB-4725	10011-472
R1531	Same as R1524		
R1532	RESISTOR, FIXED, COMPOSITION: 10 ohms; ± 5%; 1 w	Allen Bradley GB-1005	10012-100
R1533	RESISTOR, VARIABLE: composition; 1,000 ohms; ± 10%; 2 w	Allen Bradley type J	12053
R1534	Same as R1522		
R1535	RESISTOR, VARIABLE: composition; 1,000 ohms; ± 10%; 2 w	Allen Bradley type J	10141
R1536	Same as R1535		
R1537	Same as R1535		
R1538	Same as R1535		
R1539	Same as R1535		
R1540	Same as R1532		
R1541	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5%; 1/2 w	Allen Bradley EB-1045	10011-104
R1542	RESISTOR, VARIABLE: composition; 5,000 ohms; ± 10%; 2 w	Allen Bradley type J	10380
R1543	RESISTOR, FIXED, COMPOSITION: 560 ohms; ± 5%; 1/2 w	Allen Bradley EB-5615	10011-561
R1544	Same as R1519		
R1545	RESISTOR, VARIABLE: composition; 1 megohm; ± 10%; 2 w	Allen Bradley type J	10407
R1546	Same as R1519		
R1547	RESISTOR, VARIABLE: composition; 200,000 ohms; ± 5%; 2 w	Allen Bradley type J	10139
R1548	Same as R1522		
R1549	RESISTOR, VARIABLE: composition; 500,000 ohms; ± 10%; 2 w	Allen Bradley type J	10379-504
R1550	RESISTOR, FIXED, COMPOSITION: 390 ohms; ± 5%; 1/2 w	Allen Bradley EB-3915	10011-391
R1551	RESISTOR, VARIABLE: composition; 250,000 ohms; ± 10%; 2 w	Allen Bradley type J	10379-254
R1552	Same as R1523		
R1553	RESISTOR, FIXED, COMPOSITION: 82 ohms; ± 5%; 2 w	Allen Bradley HB-8205	10377-820
R1554	Same as R1553		
R1555 thru R1559	Not used		
R1560	Same as R1541		
R1561	Same as R1541		
R1562 thru R1569	Not used		

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1570	Same as R1550		
R1571 A, B	RESISTOR, VARIABLE: composition; dual ganged; 2,000 ohms both sections	Helipot type 7221	18272
R1572	Same as R1533		
R1573	Not used		
R1574	Not used		
R1575	RESISTOR, FIXED, WIREWOUND: 221 ohms; ± 1%; 1 w	IRC style DCF 221 ohm 1w, 1%	18288
R1576	RESISTOR, FIXED, WIREWOUND: 38.3 ohms; ± 1%; 2 w	IRC style MDH 38.3 K 2 w, 1%	18276
R1577	RESISTOR, VARIABLE, WIREWOUND: 11,000 ohms; ± 1%; 2 w	IRC style MDF 11.0 K 2 w, 1%	18273
R1578	Not used		
R1579	RESISTOR, FIXED, WIREWOUND: 39,200 ohms; ± 1%; 2 w	IRC style MDF 39.2 K 1 w, 1%	18277
R1580	RESISTOR, FIXED, WIREWOUND: 2430 ohms; ± 1%; 1 w	IRC style 2.43 K DCF 1 w, 1%	18287
R1581	RESISTOR, FIXED, COMPOSITION: 56 ohms; ± 5%; 1/2 w	Allen Bradley EB-5605	10011-560
S1501	SWITCH, ROTARY: DPDT, 3 amp, 250 v 6 amp, 125 v	Arrow Hart and Hegeman 81727	11969-1
S1502	SWITCH, ROTARY: SPDT, 1 amp, 250 v 3 amp, 125 v	Arrow Hart and Hegeman	11967
S1503	SWITCH, ROTARY: 5P3T, Oak mfr. type J	Stoddart 11946	11946
S1504	SWITCH, SENSITIVE: DPDT	Micro Switch 11SM1-T	11846
S1505	Same as S1504		
S1506	SWITCH, ROTARY: 5 pos., Oak mfr type J	Stoddart 18279	18279
S1507 thru S1509	Not used		
S1510	Same as S1501		
S1511	Not used		
S1512	SWITCH, RADIO FREQUENCY: coaxial switch	Danbury Knudsen 300-10973	11894
S1513	SWITCH, ROTARY: 5 deck, Oak mfg type J	Stoddart 18278	18278
S1514	SWITCH, SECTION ROTARY: SP4T, Oak mfg type F	Stoddart 11972	11972
S1515	Same as S1514		
S1516	Same as S1502		
S1517	Same as S1502		
S1518	SWITCH, PUSH: "CAL" switch	Gen. Control B-7001	11945
S1519	Same as S1502		
S1520	Not used		
S1521	SWITCH, ROTARY: p/o attenuator	Stoddart 18282	18282
S1522	SWITCH, RADIO FREQUENCY: coaxial "N" type	Transco Products 11100	18266
S1523	Same as S1522		
S1524	SWITCH, RADIO FREQUENCY: coaxial switch	Transco Products 1460-30	18267
V1501	ELECTRON TUBE	GE - 12AT7	12AT7
V1502	ELECTRON TUBE	GE - 5814A	5814A
Z1501	FILTER, BAND PASS: 160 Mc center freq.	I - TEL INC. FBT/2	18149
Z1502 and Z1503	Not used		
Z1504	ISOLATOR, R. F. REJECTION: 1.0 to 4.4 gc	Stoddart 18147	18147
Z1505	ISOLATOR, R. F. REJECTION: 4.4 to 10 gc	Stoddart 18148	18148

ACCESSORIES

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
A1601	CASE, ACCESSORY: holds band 3, 4 antennas	Stoddart 92344-1	92344-1
A1602	CASE, TRIPOD: holds tripod	Stoddart 92246-1	92246-1
A1603	BAG, CABLE: holds accessory cables	Stoddart 91981-2	91981-2
A1604	HANDCART, EQUIPMENT: equipment cart	Stoddart 92535-1	92535-1
E1601	ANTENNA: horn type; band 1; 1 to 2.3 gc	Stoddart 91888-1	91888-1
E1602	ANTENNA: horn type; band 2; 2.3 to 4.4 gc	Stoddart 91889-1	91889-1
E1603	ANTENNA: horn type; band 3; 4.4 to 7.3 gc	Stoddart 91890-1	91890-1
E1604	ANTENNA: horn type; band 4; 7.3 to 10.0 gc	Stoddart 91891-1	91891-1
E1605	ANTENNA: discone; 1.0 to 10.0 gc	Stoddart 90794-2	90794-2
HT1601	HEADSET, ELECTRICAL: 600 ohms	Stoddart 10796	10796
M1601	METER: remote meter assembly	Stoddart 90078-11	90078-11
MP1601	ADAPTER, ANTENNA: band 1, 2 antenna mtg	Stoddart 92341-1	92341-1
MP1602	REFLECTOR, ANTENNA: band 3, 4, antenna reflector	Stoddart 91892-1	91892-1
MP1603	TRIPOD: incl/pan and tilt head	Stoddart 92245-1	92245-1
W1601	CABLE ASSEMBLY, POWER: 6 ft lg power cable	Stoddart 11901	11901
W1602	CABLE ASSEMBLY, SPECIAL PURPOSE: remote meter cable	Stoddart 90075-2	90075-2
W1603	CABLE ASSEMBLY, SPECIAL PURPOSE oscilloscope cable	Stoddart 92909-1	92909-1
W1604	CABLE ASSEMBLY, SPECIAL PURPOSE: X-Y plotter cable	Stoddart 92343-1	92343-1
W1605	CABLE ASSEMBLY, SPECIAL PURPOSE: headphone extension cable	Stoddart 90074-1	90074-1
W1606	CABLE ASSEMBLY, R.F.: 6 ft lg	Stoddart 92477-1	92477-1
W1607	CABLE, POWER: 6 ft lg	Stoddart 93499-1	93499-1
W1608	CABLE, POWER: 2 ft lg	Stoddart 93499-2	93499-2

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
C1701	CAPACITOR, FIXED, PAPER: 2 µf; 200 vdcw	Electron Products M2-205-661	18186
C1702	CAPACITOR, FIXED, ELECTROLYTIC: 82 µf; 50 vdcw	Fansteel SP314-20	18184
C1703	Same as C1702		
C1704	CAPACITOR, FIXED, PAPER: 5000 µµf; 2000 vdcw	Electron Products BW-150	11890
C1705	Same as C1704		
C1706	CAPACITOR, FIXED, CERAMIC: 50 µµf; ± 10 % (ceramicon style)	Erie U2M	11713
C1707	Same as C1702		
C1708	Same as C1702		
C1709	Same as C1702		
C1710	Same as C1704		
C1711	Not used		
C1712	Same as C1701		
C1713	Same as C1706		
C1714	Same as C1701		
C1715	Same as C1701		
C1716 thru C1719	Not used		
C1720 thru C1793	CAPACITOR, FIXED, CERAMIC: 1000 µµf; feed-thru type	Allen Bradley FB2B-102W	11684
C1794	CAPACITOR, FIXED: 2200 µµf; 2000 vdcw	Erie Mfg. 2432002-X5S0-222M	18167
C1795	Same as C1794		
C1796	Same as C1794		
C1797	Same as C1794		
CR1701	SEMICONDUCTOR DEVICE, DIODE:	Texas Instrument 1N1692	1N1692
CR1702	Same as CR1701		
CR1703	Same as CR1701		
CR1704	Same as CR1701		
CR1705	SEMICONDUCTOR DEVICE, DIODE:	Texas Instrument 1N3018	1N3018
K1701	RELAY, ARMATURE: 4PDT; 24 vdc	Potter and Brumfield KHP-17D11	11891
K1702 thru K1710	Same as K1701		
K1711	RELAY, ARMATURE: 4PDT; 110 vdc	Potter and Brumfield KHP-17D11-110 v	18166
K1712	RELAY, ARMATURE: 3PST; 26. 5 vdc	Hufco Ind. XP5092	18169
K1713	Same as K1712		
K1714	Same as K1701		
K1715	Same as K1701		
K1716	Same as K1711		
K1718	Same as K1712		
K1719	Same as K1712		
K1720	RELAY, ARMATURE: DPDT; series 22	Segma 22RJCC-1200GSIL	18289
R1701	RESISTOR, FIXED, COMPOSITION: 191,000 ohms; ± 1 %; 1/2 w	IRC style DCC, 1 %	18283
R1702	Same as R1701		
R1703	RESISTOR, FIXED, COMPOSITION: 22,000 ohms; ± 5 %; 2 w	Allen Bradley HB-2235	10377-223

SYM	DESCRIPTION	MFR. NUMBER	STODDART NUMBER
R1704	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1035	10011-103
R1705	Same as R1704		
R1706	Not used		
R1707	Same as R1704		
R1708	RESISTOR, FIXED, COMPOSITION: 9100 ohms; ± 5 %; 2 w	Allen Bradley HB-9125	10377-912
R1709 thru R1714	Not used		
R1715	RESISTOR, FIXED, COMPOSITION: 560,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-5645	10011-564
R1716	Same as R1715		
R1717	RESISTOR, VARIABLE, COMPOSITION: 25,000 ohms;	Ohmite AS-3608	18154
R1718	Not used		
R1719	Same as R1717		
R1720	RESISTOR, FIXED, COMPOSITION: 100,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1045	10011-104
R1721	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; ± 5 %; 1/2 w	Allen Bradley EB-1535	10011-153
R1722	RESISTOR, FIXED, COMPOSITION: 20,000 ohms; ± 5 %; 1 w	Allen Bradley GB-2035	10012-203
R1723	Same as R1720		

NM-62B PARTS LIST CHANGES

BAND 1 TUNER	R105: Change "composition" to wirewound
BAND 2 TUNER	R205: Change "composition" to wirewound
BAND 3 TUNER	R305: Change "composition" to wirewound
BAND 4 TUNER	R405: Change "composition" to wirewound
POWER SUPPLY	CR807: Change to Diodes, Inc., DI530LS, SARCO #18300
VIDEO CHASSIS	R1231: Change to 10,000,000 ohms (EB-1006) SARCO #10011-106
CHOPPER CHASSIS	R1319: Change to 100 ohms: ±5%, ½w (EB-1015) - SARCO #10011-100
	CR1302: Delete
CONTROL CIRCUIT	R1553: Change to 47 ohms (HB-4705) SARCO #10377-470
	R1571: Change "composition" to wirewound
	R1573: Change to RESISTOR, VARIABLE, WIREWOUND; 100,000 ohms, 10 turn, ±3%, Duncan 3202 - SARCO #18271
	R1574: Change to "same as R1573"
	R1577: Change to "not used"
	ADD Z1507: Sampler: 160 Mc SARCO #93735
SCAN CHASSIS	C1705: Change to "same as C1701"
	C1706: Not used
	C1716: Change to "not used"
	C1717: Change to "same as C1701"
	C1718: Change to "not used"
	C1719: Change to "not used"

NM-62B PARTS LIST CHANGES
(Continued)

SCAN CHASSIS (continued)	K1720: Add "pin 8 ground to case"
	R1530, Resistor composition, 4.7K IW 5%, A & B GB 10012-472
	R1531, Resistor variable, 5K 2W A&B
METERING CHASSIS	R1162, Resistor composition, 1.2M, ½W 5% A & B EB 10011-125
	R1708: Change to "4700 ohms, lw; SARCO #10012-472"
	R1717: Change to "RESISTOR, FIXED, COMPOSITION: 15,000 ohms, ±5%, ½w; Allen Bradley EB-1535, SARCO #10011-153"
	R1718: Change to "not used"
	R1719: Change to "not used"
	R1721: Change to "same as R1719"
FIRST IF AND CONVERTER	R526: RESISTOR, FIXED, COMPOSITION, 100,000 ohms; ±5%, ½w, Allen Bradley EB-1045, SARCO #10011-104
	C-512 - 1000 PF SARCO #11902
	C-536 - 6.8 PF SARCO #11696
60 MC IF MAIN AMP	C-1044 2000 PF ERIE 10668
	C-1078 20,000PF ERIE 11767
	C-1088 20,000PF ERIE 11767
	R-1025, 15K 2W 5% 10377-153 A&B HB
	R-1026, 20K 2W 5% 10377-203

NM-62B PARTS LIST CHANGES
(Continued)

FAN CONTROL CIRCUIT	R-1556 Composition, 51 ohms 2W 5% 10377-510, Allen Bradley HB
	R-1557 Resistor variable 2.5K 2W 10012-252, Allen Bradley Type JL
	RT - Thermistor 10K @ 75°C., G.E Type 1D053
	Q1501-2N2152A, PNP Transistor 2N2152A, Motorola.

RADIATION HAZARDS

IN RADIO INTERFERENCE MEASUREMENT

1. Biological damage from exposure to intense RF radiation has been known for several years but only recently have quantitative limits been established.

2. A tri-service limit for exposure to RF radiation has been established at .01 watts/cm^2 at any frequency. This is 194 volts/meter assuming linearly polarized plane waves. General Electric has proposed that a maximum safe limit of .001 watts/cm^2 (61 volts/meter) be used for continuous exposure and that .01 watts/cm^2 be an absolute maximum not to be exceeded except under emergency conditions.

3. It is possible that personnel operating Stoddart equipment will be exposed to power densities greater than .01 watts/cm^2. This will probably occur in locations where the rf field will not be linearly polarized plane waves such as the Fresnel Zone and in close proximity to magnetrons and klystrons.

4. It is suggested that before taking measurements near suspected or known strong radiation sources that reliable information on intensity be obtained.

Direct measurements of strong signal sources can be made with RI-FI equipment if the frequency is in the tuning range. Most RI-FI equipment does not have sufficient voltage range or shielding effectiveness to accurately measure to 194 volts/meter using standard antennas. In some situations, involving concentrated fields, the use of loop probes with their large antenna factors would enable approximate measurement. Limitations in RI-FI equipment shielding sometimes permits full scale meter indication when tuned to a very strong signal even with the antenna disconnected. Needless to say, the operator should be concerned when this occurs.

The following chart provides approximate equipment range limits (full scale) in volts/meter with and without pickup devices.

The equipment would be standardized for gain in accordance with instructions on the charts supplied. Then the input attenuator should be placed in the maximum position. Continuous wave signals would be measured in FI function switch position. Pulsed signals are measured with PEAK function.

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Equipment	Antenna	Approximate field strength volts/meter Equivalent radiation levels given in table below
NM-10A	Half meter rod	2
	30" loop (90117-2)	10
(14 kc to 250 kc)	6" loop (90114-2)	100
	Loop probe (90185-1)	1000*
	No antenna (or cable)	100 to 200
NM-20B	41" rod (90291-2)	2
	Loop antenna (90298-2)	.1
(150 kc to 25 mc)	Loop probe (90185-2)	10*
	No antenna (or cable)	20
NM-30A	Tuned dipole	1 to 50
	Loop antenna (90799-2)	170 to 500*
(20 mc to 400 mc)	No antenna (or cable)	10 to 500
NM-50	Tuned dipole	30 to 180
(375 mc to 1000 mc)	No antenna (or cable)	100 to 180

Field Strength volts/meter	Radiation Level watts/cm^2
0.1	0.265×10^{-8}
2.0	1.06×10^{-6}
10.	0.265×10^{-4}
20	1.06×10^{-4}
30	2.39×10^{-4}
50	6.63×10^{-4}
100	0.265×10^{-2}
170	0.766×10^{-2}
180	0.86×10^{-2}
200	1.06×10^{-2}
500	6.63×10^{-2}
1000	0.265

$$P = \frac{(E)^2}{120\pi} = .00265(E)^2 \frac{\text{watts}}{(\text{meter})^2}$$

P = Radiation Level

E = Field Strength - $\frac{\text{volts}}{\text{meter}}$

$$P \frac{(\text{watts})}{\text{cm}^2} = 10^{-4} \times P \frac{(\text{watts})}{(\text{meter})^2}$$

* Maximum measurement shown using loop probe antenna is only practical if RI-FI equipment is not exposed to strong RF field.

STODDART NO. 40019-A

ENGINEERING DEPT.
August 27, 1959

STODDART AIRCRAFT RADIO CO., INC.
6644 Santa Monica Boulevard
Hollywood 38, California

Warranty

Stoddart Aircraft Radio Co., Inc. warrants each Radio Interference-Field Intensity Meter manufactured by them to be free from defects in workmanship and material. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. Klystron tubes, electron tubes, fuses and batteries are specifically excluded from any liability.

This warranty is effective for one year after delivery to the original purchaser. If the fault has been caused by misuse or mishandling, repairs will be billed to the purchaser. In this case, an estimate will be submitted before the work is begun.

In the event that any defect occurs, Stoddart Aircraft Radio Co., Inc. should be advised of all details and the model and serial number of the equipment. Shipping instructions and service data will be provided. To ensure safe handling, all equipment should be forwarded with protective covers in place and in strong exterior containers surrounded by several inches of rubberized hair or similar shock-absorbing material to the factory or authorized repair station via scheduled Air Freight.

CLAIM FOR DAMAGE IN TRANSIT

Equipment should be tested as soon as it is received. If it fails to operate properly, or is damaged in any manner, a claim should be filed with the transportation company. A report of the damage should be obtained by the claim agent, and this report forwarded to Stoddart Aircraft Radio Co., Inc. with model and serial number of the equipment. Advice regarding repair or replacement will be supplied immediately upon receipt of this information.

STODDART AIRCRAFT RADIO CO., INC.
6644 Santa Monica Blvd., Hollywood 38, California